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U.S. Department of the Interior
Bureau of Land Management

Buffalo Field Office October 1999

Wyodak Coal Bed Methane Project Final Environmental Impact Statement

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2000-014351/NF

MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-98/013+1310

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box [illegible]
Cheyenne, Wyoming [illegible]

In Reply Refer To:

1793 (930)

September 22, 1999

Dear Reader:

This Final Environmental Impact Statement (FEIS) has been prepared by the Bureau of Land Management (BLM) pursuant to Title 40, Code of Federal Regulations, Parts 1500 to 1508, to analyze the potential impacts of additional development of Federal coalbed methane (CBM) properties within the WYODAK Coalbed Methane Project in Campbell, Johnson, and Converse Counties, Wyoming, that were not analyzed in the Gillette South Environmental Impact Statement (EIS) and the Gillette North Environmental Assessment (EA). The WYODAK project area includes new developments within the Gillette South EIS area and the Gillette North EA area and locations now being developed exclusively on State and private leases outside the original assessment areas. The FEIS documents the analysis of the cumulative effects of drilling 3,890 productive wells in the Project area (Proposed Action) and drilling 5,890 productive wells (Alternative 1) and developing associated facilities, including roads, pipelines, and CBM compressors.

This FEIS is published in abbreviated format. Reviewers will need the WYODAK Coal Bed Methane Project Draft Environmental Impact Statement (DEIS), BLM, May 1999, for review of the complete EIS.

BLM received fifty-two comment letters on the DEIS addressing six basic topics: groundwater (the water model and monitoring); surface water (amounts produced, water management plans, and wetlands); air quality (modeling, authorizing actions, emissions and air quality related values); geology (development conflicts, coal fires, methane seepage, and subsidence); wildlife and fisheries (programmatic versus site specific analysis, unanticipated new development, and mitigation); and land use (wilderness study area impacts, access, on lease/off lease Federal authority and reclamation).

Based on new and additional information provided by commenters, the groundwater model was redone. This yielded a better calibrated prediction of modeled draw downs under the Proposed Action and under Alternative One.

An integral part of the Proposed Action is hydrologic monitoring to detect impacts on other water users and to provide data for control and operation of the Companies' CBM projects. Because of the confidential nature of some of the data and the intense competition among those companies in the coalbed methane play, the sharing of information which would have been required has met with considerable resistance from industry. As an alternative to the formation of the Powder River Area Groundwater Monitoring Organization group, the Methane Operators Group has proposed that industry would be willing to drill and equip up to two well pairs or triples per township in the project area. This would allow the BLM and Wyoming State Engineer's Office to maintain an independent monitoring network which would provide a more accurate depiction of the area wide actual draw down that is occurring. These dedicated wells would not be directly influenced by pumping as are the CBM production wells from which operators would be getting their information.

BLM will accept comments on the FEIS for a period of 30 days from the date the Environmental Protection Agency (EPA) publishes their Notice of Availability (NOA) of the FEIS in the Federal Register. We anticipate that EPA will publish their NOA on October 1, 1999. Please address written comments to Field Manager, Bureau of Land Management, Buffalo Field Office, 1425 Fort Street, Buffalo, WY 82834. We request you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision making process.

A copy of the FEIS has been sent to affected government agencies and to those persons who responded to scoping or otherwise indicated to BLM they wished to receive the document. Copies of the FEIS may be obtained from the following BLM offices:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82009
(307) 775-6256

Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834
(307) 684-1100

Bureau of Land Management
Casper Field Office
1701 East E Street
Casper, WY 82601
(307) 261-7600

This FEIS is not a decision document. Its purpose is to inform the public of the anticipated impacts associated with implementing the proposed action and to evaluate alternatives to that proposal. BLM will issue a Record of Decision after expiration of the 30 day comment period provided for this FEIS and consideration of any comments received during that period.

Comments, including names and street addresses of respondents, will be available for public review at the Bureau of Land Management, Buffalo Field Office, 1425 Fort Street, Buffalo, Wyoming, during regular business hours (8:00 a.m. to 4:30 p.m.), Monday through Friday, except holidays, and may be published as part of the Record of Decision. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives of officials of organizations or businesses, will be made available for public inspection in their entirety.

If you have any questions concerning this project, please call Richard Zander at (307) 684-1161.

Sincerely,

Alan L Kesterke

for Alan R. Pierson
State Director

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CHAPTER 1

PURPOSE OF, AND NEED FOR, THE PROPOSED ACTION

This chapter has been reprinted in its entirety and includes changes in response to comments.

This document has been prepared as an abbreviated final environmental impact statement (FEIS). It must be used in concert with the draft environmental impact statement (DEIS) to understand the analysis, which includes the response to comments received. The FEIS is organized by chapters, the same as the DEIS, but only changes (errata), new information or analysis are included. The FEIS is responsive to public comments and also to updated regulatory framework, including the recent U.S. Supreme Court decision determining federal CBM resources to be an oil and gas right, new federal regulations on regional haze, and ongoing State of Wyoming reviews of its permitting procedures and monitoring requirements for CBM development. The largest section of the document is Chapter 4, which contains a revised groundwater section. Chapter 5 - Consultation and Coordination includes an update on coordination that has taken place since the DEIS was issued and a response to the comments received. All comments were taken into consideration in the preparation of this FEIS and are included in Appendix E. Substantive issues were compiled into resource-based issue statements; in response, separate statements addressing specific issues were prepared. Those comments containing only opinions or preferences did not receive a formal response.

INTRODUCTION

Barrett Resources Corporation and Lance Oil and Gas Company representing themselves and a number of additional coal bed methane (CBM) developers (hereafter referred to as the Companies) have notified the USDI Bureau of Land Management (BLM), Buffalo Field Office, of their intent to expand CBM development on lands in the Powder River Basin (PRB). This expansion would include federal lands and federal minerals administered by the BLM and USDA Forest Service (FS), and is known as the Wyodak CBM Project. Initial development scenarios of 3,000 and 5,000 new productive wells were analyzed in combination with 640 productive wells previously addressed in the Gillette South CRM Project Environmental Impact Statement (EIS) and 250 productive wells previously analyzed in the Gillette North CBM Project Environmental Assessment (EA). In total, this EIS documents the analysis of the cumulative effects of 3,890 productive wells (Proposed Action), 5,890 productive wells (Alternative 1), 2,890 productive wells (No Action Alternative), and associated facilities, including roads, pipelines, and CBM compressors (Map 1-1).

Shortly after the Record of Decision (ROD) for the Gillette South CBM Project EIS was signed in October 1997, a meeting was held by the BLM to discuss the implications of this ROD regarding mitigation measures, monitoring requirements, and the potential and direction of additional development. Information provided subsequently by industry in 1998 regarding development plans indicated an additional 2,250 CBM wells could be drilled and operated in the PRB south of Gillette, Wyoming. Continued interest by industry added the potential for 750 wells north of Gillette. Continuing industry interest during the analysis process for this EIS indicates that three or four times the number of proposed CBM wells analyzed here in this initial development scenario may now be contemplated for the PRB. This Wyodak CBM Project EIS uses information developed in the analyses for previous CBM EAs in the area, including the Gillette North, Lighthouse, and Marquiss EAs, and it considers the effects of changes in environmental conditions and development procedures that have occurred since the Gillette South CBM Project EIS was completed.

Drilling CBM wells on lands where mineral rights are owned and controlled by the federal government must be conducted under an approved application for permit to drill (APD) issued by the BLM. In considering whether to approve APDs, the BLM must consider the possible project-specific and cumulative environmental impacts to ensure compliance with the National Environmental Policy Act of 1969 (NEPA). This draft EIS was prepared to meet that requirement. An additional analysis, which will look at the site-specific impacts of the drilling location and its relationship to the range of impacts documented in this analysis, will be completed in response to the filing of an APD and prior to approval by BLM.

The BLM's authority and decisions related to CBM development in the eastern PRB are limited to the agency's stewardship, resource conservation, and surface protection responsibilities for federal lands and minerals. As conservator of the federal surface and mineral estate, the BLM has responsibility for ensuring that the federal mineral resource is conserved (not wasted) and is developed in a safe and environmentally sound manner. However, the BLM does not authorize or control any of the following:

- CBM development involving only fee or state-owned lands and minerals;
- the appropriation (withdrawal) or subsequent beneficial use of groundwater;
- water quality;
- the discharge of CBM produced water to surface waters;
- surface water diversions, stream channel modifications, construction of new reservoirs, reservoir supply, or dam modifications to existing reservoirs;
- oil and gas well spacing; or
- air quality, including siting, permitting, emissions, and monitoring for stationary or mobile sources of air pollution and regional haze.

Regulatory areas where the BLM has shared responsibilities with other federal or state agencies include the following:

- oil and gas drilling;
- activities that would impact waters of the U.S.;
- special status species of plants or animals; and
- cultural, historical, or paleontological resources.

When actual locations and operational requirements for gas compression facilities (CBM development) are determined, permit applications would be submitted to the Air Quality Division (AQD) of the Wyoming Department of Environmental Quality (WDEQ). At that time, additional site specific air quality analyses, such as a Best Available Control Technology (BACT) analysis or Prevention of Significant Deterioration (PSD) increment analysis, may be performed. The analysis contained in this draft EIS is not intended as an air quality regulatory determination. PSD increments are used here only to evaluate air quality impacts.

PURPOSE AND NEED

The purpose of, and need for, the proposed CBM development is to allow for the orderly development of the resource to meet the energy needs of the nation. Development of federally-owned CBM also would reduce the possibility of drainage from the federal mineral estate and loss of royalties to the U.S. Treasury and the State of Wyoming. The leaseholders will be able to exercise their rights within the project area to drill for, extract, remove, and market CBM within conditions stipulated in the lease. Also included in these lease rights is the right to build and maintain necessary improvements. These rights continue throughout the lease term and any extensions or renewals granted by the appropriate authority.

The purpose of the Proposed Action is to analyze the impact of additional development of federal CBM properties within the Wyodak project area that were not analyzed in the Gillette South EIS and the Gillette North EA. This project area includes new developments within the Gillette South EIS and Gillette North EA areas and locations now being developed exclusively on state and private oil and gas leases outside these original assessment areas. An estimated 890 productive CBM wells were in place within the Wyodak project area by the end of 1998. Production statistics for 420 productive CBM wells were available for February 1998 (PI/Dwight's, 1998). Production statistics for 638 productive CBM wells were available for November 1998 (PI/Dwight's, 1999).

For the purpose of this analysis, the BLM estimates the following conditions: 1) up to one-half of all new CBM wells that would be drilled within the project area would be located on lands where these mineral rights are owned privately or by the State of Wyoming; and 2) up to one-half of all the new CBM wells that would be drilled within the project area would be located on lands where CBM mineral rights are federally owned. Drilling wells under an approved APD is the only way to determine the potential for CBM production on federal lands. The private- and state-owned gas will be developed regardless of the outcome of this decision, but under the Proposed Action the project would include development of private, state, and federal CBM properties.

The operators propose to develop CBM within the project area by increasing the total number of wells and ancillary facilities where economically feasible. This proposal would enhance recovery of methane from the project area by increasing the availability of gas supplies, thus allowing operators to provide more gas to companies distributing and supplying methane to consumers.

LOCATION OF THE PROPOSED ACTION

The proposed CBM projects are located in central Campbell and northern Converse Counties, Wyoming, within the eastern portion of the PRB. The proposals include additional development within the Gillette South EIS assessment area and the Gillette North EA assessment area, and in surrounding areas (Map 1-1). The wells would be located within a project boundary extending from approximately 33 miles north of Gillette, Wyoming to 24 miles south of Wright, Wyoming. Wells would be located on lands adjacent to the coal mines along the eastern project boundary, and would extend to a western boundary located about 18 to 36 miles to the west. For reference, this roughly rectangular area has been named the Wyodak CBM project area. The project area includes portions of the Thunder Basin National Grassland (TBNG), which is under surface administration of the FS; drilling activity currently is proposed on FS-administered federal lands. The project boundary was delineated by industry interest. There is no legal requirement for the Companies to confine drilling to this area other than their federal leases. It is significant to note that although approximately 8.1 percent of the project area is federal surface (4.5 percent BLM-administered federal lands and 3.6 percent FS-administered federal lands) (Map 1-2), federal ownership of oil and gas rights constitutes about 50 percent of the project area (Map 1-3). Federal ownership of coal rights totals about 88 percent of the project area (Map 1-4) (USDI BLM, 1998a).

AUTHORIZING ACTIONS

The BLM's Buffalo Field Office (BFO) administers oil and gas leases for all federally-owned minerals within the project area. CBM development is regulated in accordance with federal oil and gas regulations and onshore oil and gas orders. The U.S. Supreme Court recently decided the ownership of CBM in Southern Ute Indian Tribe vs. Amoco Production Company et al., a case involving CBM development in Colorado. CBM is disposable under the oil and gas leasing provisions of the 1920 Mineral Leasing Act.

Leasing of federal lands and federal minerals administered by the BLM is subject to the limitations imposed by the *Buffalo Resource Management Plan/Record of Decision* (RMP) (USDI BLM, 1985); current policy; and local, state, and federal laws. The FS's Douglas Ranger District of the Medicine Bow-Routt National Forest administers oil and gas leasing and development activities within the TBNG. Leasing and development activities on FS-administered federal lands are subject to the limitations imposed by the *Land and Resource Management Plan for the Medicine Bow National Forest and Thunder Basin National Grassland* (LRMP) (USDA FS, 1985 as amended) and the EIS for *Oil and Gas Leasing on the TBNG* (USDA FS, 1994).

Before any surface disturbance can occur on federal lands and/or federal minerals administered by the BLM, a company must have an APD approved by the BLM Field Manager for on-lease drilling. A right-of-way must be approved by the BLM for off-lease disturbance of federal surface.

Securing necessary legal access to and/or across any state- or privately-owned lands also is part of the APD approval process. The Wyoming Office of State Lands and Investments is responsible for easements and temporary uses of state lands that are required for off-lease activities. Before any surface disturbance can occur on FS-administered federal lands, a company must have a surface use plan approved by the FS District Ranger for on-lease activities, which is part of the APD that must be approved by the BLM Field Manager. A special-use permit is issued by the FS to manage off-lease activities on FS-administered federal lands. On-lease production facilities on federal lands and/or federal minerals are authorized by Sundry Notices.

The Wyoming Oil and Gas Conservation Commission (WOGCC) regulates drilling and well spacing, and requires an approved APD for all oil and gas wells drilled in the state, including federal wells. The WOGCC also regulates reserve pits and water encountered (surface flows) or produced during drilling operations.

Under current State of Wyoming laws, CBM operators are allowed to produce water with a stock/miscellaneous use WSEO permit and discharge that water with an NPDES permit from WDEQ. Producers operating with these permits are within the requirements of state laws.

The State of Wyoming considers water produced in conjunction with CBM development to be a beneficial use of groundwater and requires an approved permit from the Wyoming State Engineer's Office (WSEO) prior to the drilling of a CBM well. This WSEO permit authorizes the appropriation of groundwater from subsurface aquifers and its subsequent beneficial use at specific locations. Surface water diversion, stream channel modification, reservoir supply, construction of new reservoirs, and/or dam modification on existing reservoirs also require permits from the WSEO. Engineering designs are required, as appropriate, as part of the approval process.

The Water Quality Division (WQD) of the WDEQ regulates increasing sedimentation, erosion, and other issues affecting the quality of water. WQD also is responsible for granting a National Pollution Discharge Elimination System (NPDES) permit for surface discharge of produced waters from CBM wells. The WDEQ's NPDES permitting process, effluent limitations, and monitoring requirements for CBM produced water currently are being reevaluated. Specific requirements for discharge of CBM produced waters are being evaluated on a case-by-case basis.

The WQD also issues NPDES permits for pipeline construction activities that disturb five or more acres or involve temporary discharge to "Waters of the State" during hydrostatic testing. Beginning no later than 5/31/2002, construction projects that clear one acre or more will be required to obtain stormwater permit coverage. Types of oil and gas activities that may be covered include well pad construction, road construction, pipeline installation, and any other activity that results in clearing, grubbing, or grading of the land surface.

The WQD also administers a voluntary State Wetland Bank where landowners can temporarily "bank" newly-created wetlands as a wetlands credit. The existence of a non-wetland use is recorded to facilitate reversal of the decision creating the banked wetlands (if desired, as long as the wetland credit was not used as mitigation for another wetland impact). Where the U.S. Army Corps of Engineers (COE) exerts federal jurisdiction over banked wetlands, the outcome of decisions involving these wetlands will be in accordance with the federal regulations administered by the COE.

Federal agencies are directed to take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands by Executive Order (EO) 11990, May 24, 1977, (Protection of Wetlands). A BLM instructional memorandum summarizing the operating procedures used to implement this federal policy for all Wyoming wetlands administered by the BLM is included in Appendix A of the DEIS.

The COE authorizes activities that would impact navigable waters and waters of the U.S. through individual permits or nationwide permits for categories of activities, and also receives pre-construction notification of activities. "Waters of the U.S." is a collective term for all areas subject to regulation by the COE under Section 404 of the Clean Water Act. COE will require a permit when dredge or fill activities are planned in waters of the United States. The COE currently is in the process of developing a Programmatic General Permit (PGP) for oil and gas exploration and development activities in Wyoming having minor environmental impacts. A February 19, 1998 letter describing COE jurisdictional areas, regulated activities, and permitting requirements in relation to CBM production activities in northeastern Wyoming is included in Appendix A of the DEIS.

The AQD of the WDEQ enforces U.S. and Wyoming Air Quality Standards and Regulations, and authorizes the construction and operation of stationary compression facilities. A Section 21 permit application is required prior to the construction, modification, or operation of any site, equipment, source, facility, or process that may cause or increase the emissions of an air contaminant into the atmosphere. Emissions from all stationary sources and monitoring activities for these sources are regulated by the WDEQ. The WDEQ has the authority to set permit limits, mitigating measures, monitoring requirements, and BACT for stationary sources.

The EPA has the authority to set permit limits, mitigating measures, monitoring requirements, and maximum allowable emission rates for mobile sources (including coal trains). New federal regulations on regional haze require reductions in haze over time.

Construction within the City of Gillette, use of existing rights-of-way and easements dedicated or owned by the City, or discharge of water within the city limits into the City's storm drainage system would require permits. Additionally, the City of Gillette has noise ordinances that could affect drilling or construction within the jurisdiction. Similar permits likely would be required for the proposed project from the affected counties or the City of Wright.

As part of the APD approval process for oil and gas drilling on federal lands and/or federal minerals it administers, the BLM reviews the surface use and drilling plans submitted by a company. For CBM development, BLM is asking operators to submit a Project Plan of Development (POD), which includes a master drilling plan, a master surface use plan for all wells, and a water management plan. Each POD includes up to 32 wells.

After the BLM receives a Notice of Staking (NOS) or an APD/POD and before approval, an onsite inspection is made of the proposed drilling locations, access roads, water management, and potentially-disturbed areas. BLM personnel, company representatives, and the surface owner(s) usually attend the inspection to determine site-specific conditions for approving the APD/POD. As part of the APD/POD approval process, BLM requires standard and, in some cases, special site-specific protective measures for design and operation of the proposed project and may require establishment of additional monitoring wells.

Before construction, the Companies would be required to follow current BLM land management guidance and decisions, and comply with existing laws for threatened and endangered species; cultural, historical, and paleontological resources; and federally-protected raptor nests. The actions proposed must be in conformance with the BLM's Buffalo RMP (USDI BLM, 1985 as amended or maintained) and the BLM's oil and gas maintenance action (10/11/1990). The BLM would apply any appropriate conditions of approval to protect site-specific resources. A plan for monitoring and mitigating potential adverse impacts to groundwater and surface water would be detailed as part of this project design (Chapter 2). Standard *Conditions of Approval* for APDs used by BLM's Buffalo Field Office as the starting point for a mitigation plan are contained in Appendix B. Mitigating measures that would be considered in project design under all action alternatives are compiled in Chapter 2.

As part of the APD approval process for FS-administered federal lands, the FS reviews the surface use plan and BLM reviews the drilling plan submitted by a company. After the FS and BLM receive the NOS or APD and before approval, an onsite inspection is made of the proposed drilling locations, access roads, and other potentially-disturbed areas. Agency personnel and company representatives attend the inspection to determine site-specific conditions for approving the APD. As part of the APD approval process, the FS and BLM require standard and, in some cases, special site-specific protective measures for design and operation of the proposed project, and the FS may require additional baseline information on water resources or the establishment of additional monitoring wells.

Before construction, the Companies would be required to follow FS land management guidance and comply with existing laws. The actions proposed within the project area must be in conformance with the management goals within the FS LRMP (USDA FS, 1985 as amended). The management goal for the TBNG is to demonstrate grassland management and utilization of resources and values that are in harmony with nature's requirements and behavior, and to foster long-term economic stability and productivity of the land base and quality of life for the people and communities in the area. The TBNG is managed to provide for multiple land uses, including oil and gas development; a broad spectrum of dispersed recreation opportunities; characteristic landscapes that satisfy the adopted visual quality objectives; increased public access; wildlife and fish habitats that maintain viable populations; and water quality and increased water quantity where possible (USDA FS, 1985).

All of the TBNG is available for oil and gas leasing. Many leasing restrictions were developed by the FS in 1994 for use within the TBNG. Any restrictions applicable to drilling or production activities may be included as conditions of approval for activities on post-1994 leases. These restrictions can be reviewed to provide insight regarding conditions of approval that may be applied to future APDs within the TBNG (USDA FS, 1994). The FS would apply any appropriate conditions of approval to APDs that are needed to protect site-specific resources or conditions.

PUBLIC PARTICIPATION

Scoping Process

The Council on Environmental Quality (CEQ) regulations require an "early and open process for determining the scope of issues to be addressed and for identifying significant issues related to a Proposed Action" (40 CFR 1501.7). Scoping was conducted through a direct mail process and a public meeting. The mailing list included landowners, business groups, environmental groups, and other interested members of the public.

The Notice of Intent (NOI) for this EIS was published in the *Federal Register* on January 29, 1998, and a public meeting was held on February 5, 1998 at the Holiday Inn in Gillette. All substantive comments the BLM received during these meetings have been used to direct the scope and analysis of this EIS. Public scoping comments were accepted through March 2, 1998. A letter that summarizes both the issues raised at the public scoping meeting and contained in written comments is presented as Appendix C (3/19/98 BLM letter to "Partner") of the DEIS.

Public Review of Draft EIS

On May 14, 1999, both the Environmental Protection Agency's Notice of Availability and the BLM's Notice of Availability were published in the *Federal Register*. Over 850 copies of the DEIS were made available to the public and interested agencies for a 45-day public comment period. Subsequently, the public comment period was extended for 15 additional days. The date by which comments had to be received was July 14, 1999. A total of 52 comment letters were received during the 60-day comment period. The letters received are reproduced in Appendix E and the responses to the comments are presented in Chapter 5.

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This section describes the proposed Wyodak CBM Project and the alternatives that were developed for consideration in this EIS. Three alternatives are analyzed comparatively in the EIS: 1) the Proposed Action (project area); 2) Alternative 1 (expanded project area); and 3) the No Action Alternative. In addition, other alternatives that were considered but not analyzed in detail, also are discussed. Alternative 1 is the preferred alternative.

Plans for the development of CBM resources within the PRB have been increasing since the Proposed Action and alternatives were developed in 1998. The Proposed Action now represents only a portion (initial stage) of the CBM development that is anticipated within the PRB. Development of non-federal CBM resources (outside the scope of this EIS) is occurring more rapidly than has been anticipated here. As of September 1, 1999, 2,373 of the 2,890 CBM wells analyzed under the No Action Alternative already have been drilled (WOGCC 1999c). For the purpose of this analysis, the Proposed Action and alternatives are considered comparatively in this EIS as an initial stage of CBM development within the PRB.

THE PROPOSED ACTION

Summary

The Proposed Action consists of drilling, completing, operating, and reclaiming approximately 3,000 new productive CBM wells and related production facilities. The fee and state wells included in the Proposed Action are connected actions to the proposed federal wells. The project area is located in the eastern PRB within central Campbell County and northern Converse County, Wyoming (Map 2-1). The Companies base this proposed activity on the preliminary development plans that were submitted to the BLM in 1998.

Development of natural gas (coal bed methane) wells and related facilities associated with the Wyodak CBM Project would be included. Proposed CBM development is based on an assumed 40-acre well spacing pattern. The authority to set well spacing rests with the WOGCC. The exact well locations will be determined subsequent to this EIS during the environmental analysis conducted for each well's APD, which would be reviewed and approved on a case-by-case basis. The APD process allows conditions of approval to be developed for each well on the basis of site-specific water monitoring requirements and environmental constraints. In addition to well sites, other facilities, such as access roads, gas gathering and water disposal pipelines, electrical utilities, and compressors, would be developed to facilitate natural gas (methane) production in the well fields.

Coal bed methane is owned by the federal government for approximately 50 percent of the project area. For the purpose of this analysis, the following conditions were assumed: One-half of the 3,000 new productive wells are estimated to be federal wells; wells would be drilled by 20 individual companies, on average, each year during the initial development period of five to ten years (an estimated 7.5 years was used in the groundwater and surface water analyses); most drilling activity would occur within the initial development period; and the actual rate of development would depend on the productivity of the wells and the ability to compress and market the methane. Currently, interest in immediate CBM development is high. More than 60 companies filed APDs with the WOGCC through August 1999, for CBM well locations on federal, state, and private lands within the PRB (WOGCC, 1999c).

In addition to the proposed new wells, the Proposed Action also includes increased rates of development, CBM production, and surface water discharge and an increased area of disturbance within areas previously analyzed in the Gillette North CBM Project EA and the Gillette South CBM Project EIS (Map 1-1). Both the Gillette North CBM Project EA and Gillette South CBM Project EIS assessment areas are contained within the project area boundary for this EIS.

The proposed CBM wells would be located from approximately 33 miles north of Gillette to approximately 24 miles south of Wright, Wyoming. As stated under the "Location of the Proposed Action" in Chapter 1, the project boundary was delineated by industry interest but there is no legal requirement for companies to confine drilling to this area, other than the location of their federal leases. Under the Proposed Action, the project would include well development and production from private, state, and federal properties. However, CBM development likely would continue on private and state mineral estates, even if development of federal mineral estates were denied by the BLM.

The area analyzed under the Proposed Action (the project area) totals approximately 2,400 square miles (1,538,000 acres). Well spacing, combined with a preferred approach to locating wells, results in grouping of most wells into "pods" of about ten wells or more, depending on the structure of the coal seam. Developed areas may have up to 16 wells per square mile based on an assumed 40-acre spacing. Development typically would result in wells drilled within productive portions of the project area on a spacing determined by the WOGCC. The remaining less productive portions of the project area, where initial wells do not yield sufficient quantities of CBM, may never have any subsequent activity. The average density of new wells, if all 3,000 productive wells were drilled, would be approximately 1.3 wells per square mile. Refer to Table 2-1 for additional information.

The BLM has a general policy that requires access roads to oil and gas wells on federal lands to be crowned, ditched, and, in most cases, graveled or otherwise surfaced. The BLM's general policy is based on the typical requirements for multi-component rigs. For CBM development, an exception has been made to this policy in consideration of the following factors. A shallow well drilling rig would be used for both drilling and completion activities. This type of drill rig and the well servicing equipment that supports its operation are modest in size, when compared with multi-component drill rigs and equipment used to drill deeper conventional oil and gas wells. Each CBM well would be drilled within one to three days. Well completion also would occur within one to three days. Typically, wellpads would not be leveled unless steep terrain could not be avoided. For producing CBM wells, on average, well service visits would be expected to occur

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Table 2-1
Proposed Coal Bed Methane Development Alternatives

		Proposed Action	Alternative 1	No Action
1.	Proposed Project Area (estimated):	1,538,000 ac 2,400 sq mi	2,317,000 ac 3,600 sq mi	1,538,000 ac 2,400 sq mi
2.	Wells (projected):			
	New Productive CBM Wells (total):	3,000	5,000	2,000
	New Productive CBM Wells (federal oil & gas ownership)	1,500	2,500	0
	Maximum Well Density:	16 wells/sq mi	16 wells/sq mi	16 wells/sq mi
	Average Density (new wells only):	1.3 wells/sq mi	1.4 wells/sq mi	0.8 wells/sq mi
	Average Density (all CBM wells):	1.6 wells/sq mi	1.6 wells/sq mi	1.2 wells/sq mi
	Depth:	350 to 1,200 ft	350 to 1,200 ft	350 to 1,200 ft
	Average Production Rate (per well):	125 MCFD	125 MCFD	125 MCFD
3.	Production Pods (estimated):	300	500	200
4.	Water Discharge (estimated):			
	Water Discharge Points	500 to 1,000	833 to 1,667	333 to 667
	NPDES Permits	167 to 333	278 to 556	111 to 222
	Maximum Annual Volume (new wells)	58,080 ac-ft/yr	96,800 ac-ft/yr	38,720 ac-ft/yr
5.	Compressors (estimated): *			
	Booster Compressors (at some production pods):			
	Stations Operational by 5/97	13	13	13
	Additional Stations	147	147	147
	Total Number of Stations	160	160	160
	380 HP Booster Compressor Engines Operational by 5/97	13	13	13
	Additional 380 HP Booster Compressor Engines	220	220	220
	Total Number of 380 HP Booster Compressor Engines	233	233	233
	Number of Compressors per Station	1-2	1-2	1-2
	Compressor (Engine) Capacity (gas volume)	2.1 MMCFD	2.1 MMCFD	2.1 MMCFD
	Compressor (Engine) Capacity (wells)	20	20	20

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Table 2-1 (continued)
Proposed Coal Bed Methane Development Alternatives

	Proposed Action	Alternative 1	No Action
5. Compressors (estimated) - continued: *			
Field Compressors			
Stations Operational by 5/97	15	15	15
Additional Stations	34	34	34
Total Number of Stations	49	49	49
1000 HP Field Gathering Line Engines Operational by 5/97	5	5	5
Additional 1000 HP Field Gathering Line Engines	13	13	13
Total Number of 1000 HP Field Gathering Line Engines	18	18	18
Number of Compressors per Station	1-6	1-6	1-6
Compressor Engine Capacity (Gas volume)	7 MMCFD	7 MMCFD	7 MMCFD
Compressor Engine Capacity (Wells)	56	56	56
1500 HP Field Gathering Line Engines Operational by 5/97	39	39	39
Additional 1500 HP Field Gathering Line Engines	43	43	43
Total Number of 1500 HP Field Gathering Line Engines	82	82	82
Number of Compressors per Station	1-4	1-4	1-4
Compressor Engine Capacity (Gas volume)	5 MMCFD	5 MMCFD	5 MMCFD
Compressor Engine Capacity (Wells)	40	40	40
Pipeline Compressors			
Stations Operational by 5/97	0	0	0
Additional Stations	5	5	5
Number of Stations	5	5	5
1500 HP Transmission Pipeline Engines Operational by 5/97	0	0	0
Additional 1500 HP Transmission Pipeline Engines	18	18	18
Total Number of 1500 HP Transmission Pipeline Engines	18	18	18
Compressor Engine Capacity (Gas volume)	22.5 MMCFD	22.5 MMCFD	22.5 MMCFD
Compressor Engine Capacity (Wells)	N/A	N/A	N/A

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Table 2-1 (continued)
Proposed Coal Bed Methane Development Alternatives

	Proposed Action	Alternative 1	No Action
6. Transmission Pipeline Capacity (estimated):			
Available Pipeline Capacity (by the end of 1998):			
Redstone	40 MMCFD	40 MMCFD	40 MMCFD
Western Gas Resources	120 MMCFD	120 MMCFD	120 MMCFD
TOTAL	160 MMCFD	160 MMCFD	160 MMCFD
Pipeline Capacity (life of project):			
Redstone	40 MMCFD	40 MMCFD	40 MMCFD
Western Gas Resources	585 MMCFD	585 MMCFD	585 MMCFD
Thunder Creek	450 MMCFD	450 MMCFD	450 MMCFD
Misc. (wet gas line capacity for CBM gas)	20 MMCFD	20 MMCFD	20 MMCFD
TOTAL	1,095 MMCFD	1,095 MMCFD	1,095 MMCFD

* Compression facilities were estimated based on logical field-wide development plans, and do not vary by alternative. Alternatives are based on differing well numbers considered in this analysis. Compression is designed to handle both the Proposed Action and Alternative 1 activity levels.

Note:
Gas production is measured in cubic feet per day.
MCFD represents 1,000 cubic feet per day; MMCFD represents 1,000,000 (one million) cubic feet per day.
ac = acres; sq mi = square miles; ac-ft/yr = acre-feet per year (1 acre-foot = 325,829 gallons).

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once a month. As a result, two-track unimproved roads or trails would be used for access to the majority of CBM wells. In some cases, roads will need to be upgraded to the BLM's minimum standards due to special conditions such as rough topography or stream drainage areas.

The project would develop over time as the Companies implement their various CBM projects. Drilling activity would be concentrated within an estimated five-year to ten-year initial development period. A certain number of wells would be drilled and connected to pipelines each year within portions of the project area. Numerous companies may drill wells during the same given year. Actual well locations will be determined by the success of previous drilling, which determines where CBM can be produced efficiently. Lower numbers of wells being drilled could result from various economic factors that would cause companies to limit activity. A study conducted by the BLM projects an estimated average CBM well life of 12 years (USDI BLM, 1996a).

For the purposes of this analysis, the productive life of a CBM well is estimated to be 12 years. However, the cessation of groundwater pumping may not occur 12 years after a CBM well is drilled. If all wells in a given geographic area are not drilled at the same time, then groundwater may continue to be pumped from wells that are no longer productive in order to continue efficient CBM production from nearby productive wells. Therefore, for the purposes of groundwater and surface water analysis only, the groundwater withdrawal and surface disposal of produced water is estimated to occur over 15 years (on average). The estimated productive life of the project is 12 to 20 years, as the first wells drilled would no longer be productive after 12 years. The last wells drilled during the five-year to ten-year (7.5-year average duration) initial development period would no longer be productive after 20 years.

The Companies propose to develop well fields within the project area for the Wyodak CBM Project EIS, consisting of the following development activities:

- Approximately 3,000 additional productive wells based on an assumed 40-acre well spacing pattern;
- Associated transportation infrastructure, such as roads, pipelines, and utilities;
- An estimated 34 additional field compressor stations (in May 1997, 15 field compressor stations were in use):
- An estimated 147 additional booster compressor stations (in May 1997, 13 booster compressor stations were in use):
- An estimated 5 new pipeline compressor stations (in May 1997, no pipeline compressor stations were in use); and
- Produced water discharge facilities authorized by the State of Wyoming and other agencies, as appropriate, including an estimated 500 to 1,000 additional NPDES discharge points authorized in 167 to 333 NPDES permits.

The Proposed Action would consist of the following components proposed by any lessees or operators (operators), as defined in Onshore Order No. 1 issued under 43 CFR 3164: a) road access for drilling operations; b) drilling operations; c) well production facilities; d) electrical distribution lines; e) power generation; f) production pods; g) pipelines (gas gathering system, produced water gathering system and discharge facilities, gas delivery system); and h) pipeline compression (Tables 2-1 and 2-2).

Road Access for Drilling Operations

Access to drill locations from the existing road network already in place on federal, state, and private lands will be provided primarily by two-track roads traversing over natural terrain along pipeline rights-of-way whenever feasible. Travel on two-track roads would be rescheduled or postponed during infrequent periods of wet weather when vehicular traffic could cause rutting. Well access roads will be maintained in an undisturbed, two-track status, unless road upgrades are needed to alleviate safety concerns or access difficulties. Gravel or scoria may be applied in problem areas. Troublesome areas, such as stream drainage crossings, low water crossings, and rough topography would be upgraded as the need arises. In less rugged terrain, little earthwork is anticipated for well access road construction.

In more rugged terrain, BLM experience to date has shown that construction of a rough well access road to the drill location using cut and fill construction techniques may be necessary an estimated ten percent of the time. Surface disturbance associated with crowning and ditching (normally required by BLM's general policy on design and construction of oil and gas well access roads) would occur only as required for well access roads traversing steeper terrain or rough, broken topography, or in other exceptional site-specific circumstances. Use of cut and fill construction techniques for well access roads may disturb up to 1.8 acres per well located in difficult terrain. Roads not needed for production will be reclaimed, as needed, as soon as practical after the conclusion of drilling. Roads needed for production may be upgraded, as needed, to ensure safe, year-round access. At the conclusion of the project, roads and culverts that improve access to livestock pastures or calving areas, cultivated fields, ranch buildings, or other areas could be left in place with surface owner concurrence. All roads no longer needed will be reclaimed.

Drilling Operations

Typically, drilling operations will be confined within a 100 feet by 100 feet well site area that is not leveled and is not cleared of vegetation. The use of cut and fill construction techniques to level work areas will be limited to areas where the land surface is too steep to allow the drill rig to set up over natural terrain. In areas where limited cuts and fills are necessary, vegetation may be disturbed or removed. Use of cut and fill construction techniques for well sites may be necessary an estimated ten percent of the time and may disturb up to 0.25 acre per well that is located in difficult terrain. Areas disturbed, but not needed for production, will be reclaimed as soon as practical after the conclusion of drilling. At the conclusion of the project, all disturbed areas no longer needed will be reclaimed.

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Table 2-2
Acres of Potential Surface Disturbance Associated with Proposed CBM Development

	Proposed Action	Alternative 1	No Action
Potential Short-term Disturbance Only (until facilities completed and reclaimed)			
Drill Sites (during drilling) [a]	825	1,375	550
Water Discharge Pipelines	4,500	7,500	3,000
Pod Gathering Lines to Trunklines	2,910	4,850	1,940
Trunklines to Compressors	2,038	2,038	2,038
TOTAL Potential Short-term Disturbance (acres) *(percentage of area analyzed)*	*10,273* *0.7%*	*15,763* *0.7%*	*7,528* *0.5%*
Potential Long-term Disturbance (during production)			
Well Access Roads & Pipelines (gathering lines including produced water discharge points)	5,400	9,000	3,600
Well Sites for Productive CBM Wells	36	60	24
Production Pod Facilities	75	125	50
New Field Compressor Stations	51	51	51
New Booster Compressor Stations	37	37	37
New Transmission Pipeline Compressor Stations	15	15	15
Improved Roads to Production Pods	900	1,500	600
TOTAL Potential Long-term Disturbance (acres) *(percentage of area analyzed)*	*6,514* *0.4%*	*10,788* *0.5%*	*4,377* *0.3%*
TOTAL POTENTIAL SURFACE DISTURBANCE (acres) [b] (percentage of area analyzed)	16,751 1.1%	26,491 1.2%	11,881 0.8%

[a] Up to 10% more new CBM wells may be drilled (drill sites) than are produced (as well sites). Short-term drilling disturbance from unproductive wells is included. Acreage for drill sites (during drilling) encompasses acreage for productive CBM well sites.

[b] Does not include acreage for productive CBM well sites. This acreage already is included under drill sites (during drilling).

Notes:

Potential Surface Disturbance is estimated in acres. (For reference: 43,560 square feet = 1 acre; 640 acres = 1 square mile).

Short-term Disturbance = Disturbance during drilling or installation of facilities, followed by reclamation, up to approximately 3 years.

Long-term Disturbance = Disturbance continuing during the productive life of the project, which would be approximately 12 to 20 years, followed by reclamation.

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A mobile drilling rig will be driven to the well site and erected. Typically, a truck-mounted shallow well drilling rig will be used to drill CBM wells. Additional equipment and materials needed for drilling operations, including water, would be trucked to the well site. The proposed project would require approximately 8,000 gallons (or 0.08 acre-feet) of water per well for cement preparation, well stimulation, dust control, and possibly drilling (non-toxic drilling mud is required to handle certain downhole conditions). Drilling mud usually is native mud and bentonite used for fresh water drilling. As hole conditions dictate, small amounts of polymer additives and/or potassium chloride salts may be added for hole cleaning and clay stabilization.

The drill rig typically will be set up over natural terrain. A temporary mud pit approximately six feet deep, ten feet wide, and up to thirty feet long, would be excavated within each well site area, used during drilling and completion operations, and then allowed to dry before being backfilled and reclaimed. The pits will be fenced on three sides during drilling operations, with the fourth side fenced immediately upon rig release. Each producing well would be drilled to a depth of 350 feet to 1,200 feet or deeper, and would have steel casing cemented from the top of the coal seam to the surface. The well control system would be designed to meet the conditions likely to be encountered in the hole and would be in conformance with BLM and State of Wyoming requirements.

The drilling and completion operation for a CBM well normally requires approximately seven to 25 people at a time, including personnel for logging and cementing activities. Each well would be drilled within a period of one to three days. In preparation for production of gas from a drilled, cased, and cemented well, a well completion program may be initiated to stimulate production of gas and to determine gas and water production characteristics. A mobile completion rig similar to the drill rig may be transported to the well site, erected, and used to complete a well. Completion operations are expected to average one to three days per well. Methane may be vented and water temporarily discharged for a very short period of time during testing to determine whether wells will be produced. Once determined to be productive, wells would be shut-in until pipelines and other production facilities are constructed.

Well Production Facilities

If wells are productive, a very small part of each well site, represented by a square area with perhaps five or six feet on each side of the square, will be leveled to install wellhead facilities. A weatherproof covering will be placed over the wellhead facilities. No additional structure will be constructed at the well site for gas-water separation facilities. A downhole pump typically will be utilized to produce water from the uncased open hole interval located below the steel production casing. Methane gas will flow to the surface using the space between the production casing and the water tubing. No pumpjacks will be located at the wellheads. The long-term surface disturbance (12 to 20 years) at each productive well location where no cut and fill construction techniques are utilized is likely to encompass a negligible area, much less than 0.1 acre. The long-term surface disturbance at each productive well location where cut and fill construction techniques are utilized is likely to encompass approximately 40 feet by 80 feet, or approximately 0.1 acre.

Well site production facilities typically will not be fenced or otherwise removed from existing uses.

Pipeline trenches for well gathering lines are expected to disturb portions of 40-foot wide corridors temporarily and to be reclaimed as soon as practical after construction is completed. Trenches will be constructed along the two-track well access roads wherever possible. Separate gathering lines, averaging one quarter to one-half mile long each, will be buried in the trenches and will transport methane gas to production pod facilities and produced water to discharge points.

At the conclusion of the project, roads, culverts, cattleguards, pipelines, stock watering facilities, or other structures could be left in place for any beneficial purpose of the surface owner. Electrical service would be available where CBM wellhead or pod production facilities were located, at the landowner's expense. Water wells and produced water would be available to the surface landowner, with appropriations, diversion, and storage rights already properly filed with the WSEO. Ponds and reservoirs would continue to store water if surface owners elect to manage the wells and continue pumping water from them. All federally-owned surfaces that contain disturbed areas or facilities that are no longer needed will be reclaimed. All disturbed areas and facilities that are no longer needed and are located on private land also will be reclaimed, unless landowners elect to manage the wells and continue pumping water from them, or desire to keep the access roads intact.

Electrical Distribution Lines

Electricity would be used to power downhole pumps during well development and to initiate and maintain production. A limited number of newly-constructed, high-voltage distribution lines are anticipated. Electricity will be routed to well sites and ancillary facilities within the transportation corridor. Direct burial cable will be the preferred method of electrification, unless otherwise impractical. Electrical lines connecting the wells and the production pods will be buried in the trenches excavated for well gathering lines. Overhead electrical lines will be installed along the pod access road or in a more suitable location. All overhead electrical lines will utilize raptor protection designs. At the conclusion of the project, overhead distribution systems not owned by the operators may or may not be salvaged. Operators will reclaim areas and facilities no longer needed.

Power Generation

Both natural gas-fired and diesel engine-powered generators may be used on a temporary basis at individual wells until electrical distribution lines are constructed. Either electrical motors or natural gas-fired reciprocating or microturbine engines will power booster or blower units. Future compressors are anticipated to be natural gas-fired or electrical units.

PRODUCTION PODS

Typically, gas production from each well will be individually measured and mechanically or electronically recorded at a central collection point or pod building. The siting of production pods is tied to the siting of CBM wells, which is accomplished site-specifically at the Application for Permit to Drill/Plan of Development (APD/POD) level of analysis. Gas gathering lines for an average of ten wells will be tied together in a production pod, where metering for all the wells in that pod will be done. At the production pod, gas is commingled into the gas gathering system, which transports it to the compressor station. An improved road, averaging one-half mile in length, will be constructed to each production pod and will disturb an area not expected to be wider than 50 feet. Each production pod facility will disturb approximately 0.25 acre. At the conclusion of the project all disturbed areas and facilities no longer needed will be reclaimed.

Pipelines

Three types of pipelines would be constructed as part of the proposed project:

1. Gas-gathering pipeline systems (low pressure, from wellhead to pod building, and from pod building through trunkline to the compressor station)
2. Produced water-gathering pipeline systems
3. Gas-delivery pipelines (high pressure, from compressor station to existing transmission pipelines)

Reclamation of pipeline corridors will occur as soon as practical after pipeline construction is completed.

Gas-Gathering System

As part of the transportation corridor system linking the wells and ancillary facilities, gas-gathering pipelines and produced water-gathering pipelines would be constructed, placed together in the same trench/ditch, when practical, and buried. Construction and installation of pipelines would occur immediately after well drilling. Access roads typically will follow the pipeline right-of-way, except in a limited number of cases where topography dictates or as surface owners require. Separate gathering lines will transport methane gas to production pod facilities and produced water away from wells to points where water discharge will occur.

Pod gathering lines, averaging two miles long, each are expected to disturb portions of 40-foot wide corridors, and will transport gas from each production pod to a trunkline. Separate trunklines, averaging six miles long each, will disturb portions of 50-foot wide corridors, and will transport gas to compressor stations.

[illegible]

The pipeline capacity for the [illegible] (MMCFD). As the existing [illegible] [illegible] CBM produced water is in question.

Pipeline Compression

[illegible] pipeline.

The use of low temperature [illegible] natural gas [illegible] may be required to enhance gas flow [illegible] a booster compressor station [illegible] [illegible] 1,400 psi. In May [illegible]

[illegible]

compressor stations each would support one to four 1,500-HP or one to six 1000-HP engines and each station would disturb approximately 1.5 acres. The Proposed Action also will require five new transmission pipeline compressor stations, which would contain a total of 18 1500-HP engines; each station would disturb approximately 3 acres. All compressors are expected to be housed within structures. Most compressor stations are expected to be built along existing roads and are not expected to require any new roads or improvements to existing roads.

Anticipated Level of Activity and Project Life

The total project life, including production, is expected to be 12 to 20 years. The estimated initial development period (drilling phase) is 5 to 10 years. APDs for federal wells would be approved by the BLM. Twenty companies, on average, may have CBM development projects operating concurrently within the project area during the initial development period. Approximately 50 to 400 wells per year may be drilled by each Company. The minimum number of drilling rigs required to drill 400 wells annually would be twelve drilling rigs conducting drilling or completion operations concurrently for an estimated 200 to 300 days within a calendar year (the estimated period when weather and soil conditions are suitable for access to the well location and drilling or well completion operations). It is likely that the Companies would utilize, on average, an estimated 25 drilling rigs to allow for poor weather conditions, mechanical problems, and scheduling concerns.

Hydrologic Monitoring and Mitigation

An integral part of the Proposed Action is the hydrologic monitoring that detects impacts on other water users and provides data for control and operation of the Companies' CBM projects. Monitoring plans administered by the State of Wyoming and the BLM will address the following: objectives; standards; procedures; timeframes; data management; and groundwater and surface water monitoring.

Plans would address the following:

- Monitoring required under the terms of NPDES discharge permits issued by the WDEQ, APDs approved by the WOGCC or surface management agency (BLM or FS), groundwater or surface water appropriation permits approved by the WSEO, and on-location pit permits approved by the WOGCC;
- Requirements for reporting on surface flows encountered during drilling to WOGCC; and
- Requirements contained in any executed Water Well Agreement.

Plans for hydrologic monitoring and mitigation would be re-evaluated periodically by the authorizing agencies in collaboration with the BLM, other involved surface management agencies, WDEQ, WSEO, WOGCC, CBM operators, landowners, coal operators, and other downstream interests.

Whether production of methane occurs by encountering free gas trapped in the coal seam or by pumping water to reduce pressure and induce gas flow, it is possible that nearby water wells completed in the coal could experience a decline in hydraulic head (for example, an increase in the depth to the static water level in the well bore). If the decline in head were a significant part of the total available head at a particular water well, then that water well likely would experience a reduction in its capacity to deliver water (yield) and possibly an increase in the concentration of methane.

Monitoring has been occurring in the Gillette North CBM Project EA and Gillette South CBM Project EIS assessment areas to validate predicted impacts and to identify needed mitigation. This monitoring would be continued and expanded to cover the Wyodak CBM EIS assessment area. The Water Well Agreement, previously worked out by landowners and CBM operators as part of the Gillette North CBM Project EA and Gillette South CBM Project EIS, will be required to be offered to affected surface owners before federal APD's will be approved. BLM will continue to suggest that operators also make this agreement available to surface owners when developing private- and state-owned minerals. A copy of this agreement is contained in Appendix D of the DEIS.

A water well agreement format was developed by a working group of affected landowners and industry representatives (USDI BLM, 1997a). The BLM is not a party to this agreement. The BLM requires that CBM operators on federal leases offer this agreement to affected landowners. The Water Well Agreement between a CBM operator and an affected landowner addresses monitoring of any properly-permitted water well that falls within the Circle of Influence (COI) of a CBM production well. This COI is defined as a one-half mile radius around a CBM well. The Water Well Agreement also addresses how the COI would be expanded, should there be interference with a water well within the COI. If no water well falls within the initial COI, the COI would be expanded to the next nearest water well. If wells within the COI are impaired by CBM activities, they can be mitigated by reconfiguring, redrilling, installing a new well, or by other means.

If landowners do not accept the Water Well Agreement, a second option for water well mitigation will be used. This would be mitigation of CBM impacts in accordance with state water law. This would occur if a determination showed CBM development to be interfering with historic permitted usage of water. Neither well yields or water levels are guaranteed by a water right. Mitigation under state law would be developed on a case-by-case basis, in consultation with the WSEO, the affected landowner, the operator, and the BLM. Possible ways in which mitigation could be accomplished at the cost of the operator are: temporary replacement with commercially-purchased water or water produced by the operator, or reimbursement to a well owner for increased pumping costs associated with a greater lift. Permanent replacement would be accomplished by drilling a replacement well.

Through the independent groundwater monitoring program being carried out by the BLM and the WSEO, information on lowered water levels (drawdown of the static water levels in wells completed within the coal seam) and on the status of the sand aquifers is being obtained and tracked. This information will enable the BLM and the WSEO to evaluate impacts. This information could be greatly supplemented if all monitoring information being gathered by operators was brought into one common database. The coal operators are carrying out this type of activity under the direction of the Gillette Area Groundwater Monitoring Organization (GAGMO).

The Gillette North EA and the Gillette South EIS contained requirements that the CBM operators form a group, Power River Area Groundwater Monitoring Organization (PRAGMO), that would be similar to the coal operators' GAGMO group. This group was formed because impacts to the groundwater were of the highest concern in the respective project areas. The purpose of the group was to provide a common reporting method and data base of their monitoring results. The data this group was to gather was to be compiled, interpreted and furnished to the BLM and the WSEO along with a yearly combined drawdown map of the results of their CBM activity. Their comprehensive, un-interpreted data also was to be furnished to the agencies.

Because of the confidential nature of some of the data and the intense competition among companies in the coal bed methane play, the sharing of information which was required has met with considerable resistance from industry.

As an alternative to the PRAGMO group, the Methane Operators Group has proposed that industry would be willing to drill and equip up to two well pairs or triples per township in the project area. This would allow the BLM and the WSEO to maintain an independent monitoring network that would provide a more accurate depiction of the actual drawdown that is occurring area-wide. These dedicated wells would not be influenced directly by pumping, as are the CBM production wells from which operators are getting their information.

Specific Monitoring Activities

Groundwater

In lieu of the PRAGMO requirement described in the DEIS, the following will be required from the appropriate CBM operator(s):

- Baseline static water levels, production capacity and methane concentrations for all properly permitted wells within the COI as defined by the Water Well Agreement, in Appendix D of the DEIS. Data is to be furnished to the BLM and WSEO in an electronic format.
- Monthly reports containing the following information for each CBM well will be submitted to the WOGCC: a) well name, water well permit number, API number, and location; b) reporting dates, name of individual responsible for report, and method of measurement; c) total volumes of water and gas produced during the reporting period and cumulatively since reporting began; and d) remarks or comments regarding data acquisition. The WOGCC will forward these monthly reports to the WSEO and the BLM in an electronic format.
- Monitoring of produced water discharges as required by WDEQ for NPDES permits. Report is to be furnished to the WDEQ and the BLM.

- Water quality analyses for surface flows encountered during drilling as required by WOGCC.

- Drilling, completion, and equipping, to BLM specifications, of additional (up to two sites per township) paired or tripled dedicated monitor wells by industry. Wells are to be operated by BLM and/or WSEO.

- Depending on available agency funding, possible additional financial support for data collection and support in compiling and interpreting the data.

The following monitoring would be continued by the BLM as a result of the Marquiss, Lighthouse, and Gillette North and Gillette South CBM projects to provide independent verification of hydrologic activities. Depending on federal budget availability, it may become necessary for the CBM operators to pay for some or all of this monitoring through cost reimbursement.

The BLM would conduct continuous monitoring of groundwater levels and gas pressure of selected wells completed in the coal and periodic (one to two months) measurement of methane concentrations at these wells. Several of these monitoring sites could include additional well(s) near the coal well completed in the next shallower sand(s) above the coal. Some of the well sets would include a coal completion well and a well completed in the next sand below the coal. If adequate existing wells are available, they may be substituted for some of the wells described in this analysis (or possibly added to the network). Additional wells would be required with the new development proposed in this EIS. The monitoring well schedule and final location of monitoring wells ultimately would be a function of the final CBM development scenario and schedule. The BLM would conduct the following sampling:

- Periodic (one or two times per year) monitoring of additional water wells that operators are not monitoring, located farther from the project area.

- Water quality sampling from selected monitoring wells on a semi-annual basis, analyzed for the constituents shown in Table 2-3.

Additional Monitoring Wells

In coordination with the WSEO, an adequate number of monitoring wells would be added to the existing monitoring wells that were established previously as part of the Gillette North CBM Project EA and Gillette South CBM Project EIS assessment and decision process (Table 2-4). Installation of the monitoring wells required under the Gillette South EIS and Gillette North EA progressed in 1998 with the addition of one new well pair and the finalization of one ongoing completion. The WSEO completed five monitoring locations (4 paired) and plans on completing a fifth pair in 1999. With the addition of these wells, there are a few locations where the BLM is waiting on the completion of required wells (Table 2-5). This would satisfy BLM's immediate

Table 2-3
Required Constituents for Water Quality Sampling from Monitoring Wells

Parameter	Unit
Total Petroleum Hydrocarbons (TPH)	mg/l
pH	Standard Units
Total Dissolved Solids (TDS)	mg/l
Specific Conductance	µmhos/cm
Chlorides	mg/l
Sulfates	mg/l
Radium-226	pCi/l
Aluminum*	µg/l
Total Antimony	µg/l
Total Arsenic	µg/l
Total Barium	µg/l
Total Beryllium	µg/l
Cadmium*	µg/l
Chromium*	µg/l
Copper*	µg/l
Cyanide (total)	µg/l
Total Iron	µg/l
Lead*	µg/l
Total Manganese	µg/l
Mercury*	µg/l
Nickel	µg/l
Phenol	µg/l
Selenium*	µg/l
Silver*	µg/l
Total Thallium	µg/l
Zinc*	µg/l
Hardness	mg/l as $CaCO_3$

Notes:

µmhos/cm = thousandths of unit of conductance per centimeter (2.54 centimeters = 1 inch)

mg/l = milligrams per liter (1 mg = 1 ppm [part per million]; 1 liter = 0.264 gallons)

µg/l = micrograms per liter (1 µg = one thousandth of a milligram or 0.001 mg or 1 ppb [part per billion])

* Refers to the acid soluble portion which is derived as the fraction that passes through a 0.45 µm membrane filter after the sample is acidified to a pH of 1.5 - 2.0 with nitric acid.

Table 2-4
Completed CBM Monitor Wells

Approximate Well Location	Target Zone of Completion	Comments
T53N R73W S21	COAL	Existing well Hall #33-2633
T53N R73W S21	OVERBURDEN SAND	Sand well of well pair.
T49N R73W S3	COAL	WSEO CBM MON #2
T49N R73W S3	OVERBURDEN SAND	WSEO CBM MON #2W
T49N R74W S36	COAL	WSEO CBM MON #1
T49N R77W S1	COAL	Gillmore O&G well acquired 3-98, plugged back and recompleted
T48N R73W S36	COAL	WSEO CBM MON #3
T48N R73W S36	OVERBURDEN SAND	WSEO CBM MON #3W
T48N R72W S22	COAL	Coal well of a set of wells completed for the Marquiss project.
T48N R72W S22	OVERBURDEN SAND	Overburden sand well of a set of wells completed for the Marquiss project.
T48N R72W S22	SHALLOW CONFINED SAND	Additional (shallower) overburden sand completed at this location to evaluate vertical leakage.
T48N R72W S22	UNCONFINED SAND	Unconfined (shallowest saturated) sand completed at this location to evaluate vertical leakage and recharge.
T48N R77W S12	COAL	Arco Federal 12-2. Drilled out bridge plug, plugged back and recompleted. (SASQUATCH)
T47N R71W S19	COAL	Existing (Cordero well).
T47N R72W S2	COAL	Coal well of a set of wells completed for the Marquiss project.
T47N R72W S2	OVERBURDEN SAND	Overburden sand well of a set of wells completed for the Marquiss project.
T47N R72W S7	COAL	Hoe Creek DOE project.
T47N R72W S7	OVERBURDEN SAND	Hoe Creek DOE project.
T47N R72W S36	COAL	Existing (Amoco well).
T47N R73W S16	COAL	WSEO CBM MON #4
T47N R73W S16	OVERBURDEN SAND	WSEO CBM MON #4W
T46N R72W S6	COAL	Existing (Cordero well).
T46N R72W S25	COAL	Coal well of well pair
T46N R72W S25	OVERBURDEN SAND	Sand well of well pair
T46N R74W S16	OVERBURDEN SAND	Sand well of well pair
T45N R71W S6	COAL	Coal well of well pair
T45N R71W S6	OVERBURDEN SAND	Sand well of well pair
T45N R73W S1	COAL	Coal completion in a dual completion well.
T45N R73W S1	OVERBURDEN SAND	Sand completion in a dual completion well.

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Table 2-4 (continued)
Completed CBM Monitor Wells

Approximate Well Location	Target Zone of Completion	Comments
T45N R74W S36	COAL	WSEO CBM MON #6
T45N R75W S31	COAL	Shagin Federal #2 acquired from Exxon 11-96.
T44N R71W S31	COAL	Coal well of three well set
T44N R71W S31	OVERBURDEN SAND	Overburden sand well of three well set
T44N R71W S31	UNDERBURDEN SAND	Underburden sand well of three well set
T44N R72W S14	COAL	Coal well of well pair
T44N R72W S14	OVERBURDEN SAND	Sand well of well pair
T43N R71W S31	COAL	Coal well of well pair
T43N R71W S31	OVERBURDEN SAND	Sand well of well pair
T42N R72W S36	COAL	Bowers 4-36

Table 2-5
Proposed CBM Monitor Wells

Approximate Well Location	Target Zone of Completion	Comments
T54N R74W S4,5	COAL	Coal 1 of well set (3 wells total)
T54N R74W S4,5	COAL	Coal 2 of well set (3 wells total)
T54N R74W S4,5	OVERBURDEN SAND	Sand well of 3 well set
T46N R74W S16	COAL	WSEO CBM MON #5
T46N R74W S16	OVERBURDEN SAND	Sand well of well pair

needs for monitoring wells under those two plans. The BLM still will need additional monitor wells for development outside these assessment areas to meet the needs of determining area-wide drawdowns. Well locations in areas north, west and south of the existing Gillette North CBM Project EA and Gillette South CBM Project EIS assessment areas (Map 1-1) are anticipated. The groundwater modeling used to analyze CBM development in this EIS would be used to determine specific well locations. Following is a list of general areas where additional monitoring information is needed:

- Areas north of T54N
- Areas west of R76W
- Areas south of T41N
- Areas west of R75W and north of T53N
- Areas west of R75W and south of T47N

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Cost Share on Wells to be Monitored by BLM

Where suitable wells do not exist for monitoring, operators would be required to obtain access, permit, drill, and properly complete wells (including PVC casing, stainless steel screen where appropriate, sand pack where appropriate, logging, and cementing) where necessary, in relation to their projects. In addition, operators would provide and install necessary support facilities (shelter and fence) and would be responsible for the cost of the monitoring equipment as specified by the BLM. The BLM would provide requirements for instrumentation and equipment and would provide labor to monitor the wells.

Implementation of Monitoring

The monitoring well schedule and final locations ultimately would be a function of the CBM development scenario and schedule. If necessary, monitoring wells will be added as conditions of approval for APDs/PODs.

Surface Water

The following would be required of the operators:

- Monitoring of produced water discharges as required by WDEQ for NPDES permits. Report is to be furnished to the WDEQ and the BLM.

- Monitoring of volume of produced water being discharged to the surface as required by the WSEO under Conditions and Limitations specified in each groundwater permit, by the WDEQ under the terms specified in each NPDES permit, and as required by the WOGCC for surface flows encountered during drilling. If the State of Wyoming modifies its CBM reporting requirements, then the revised requirements would apply here.

- Additional surface water stations may be needed on the Little Powder, Powder, Belle Fourche, and Cheyenne Rivers and/or their tributaries. This will depend on the location of discharge points, availability of existing data, and magnitude of the projected impact. The cost of this monitoring would be shared by the BLM and the CBM operators. With the projected budgets, it is anticipated that the operators would have to be responsible for most of this cost.

The following would be conducted by the BLM:

- Operation of a surface water gauging station on the Belle Fourche River and additional stations, as necessary, downstream of the area to be affected by surface discharge of produced water from the project area. In addition, the Cordero-Rojo Mine complex currently is operating a station on Caballo Creek.

- Periodic sampling of water quality would be done at project area discharge points and other locations and analyzed as shown in Table 2-3.

- Selected channels receiving produced water would be monitored for signs of accelerated erosion and degradation.

At the BLM operated station(s), stream flow, water temperature, and electrical conductivity of the water would be continuously recorded. In addition, periodic manually collected samples would be analyzed for the constituents listed in Table 2-3 with the addition of total suspended sediments (TSS).

ALTERNATIVE 1 (PREFERRED ALTERNATIVE)

Alternative 1 to the Proposed Action consists of drilling, completing, operating, and reclaiming approximately 5,000 new productive CBM wells and related production facilities in an expanded project area that includes all of the Proposed Action's project area (Map 2-1). This well total would be 2,000 wells more than the 3,000 wells planned under the Proposed Action. Up to 2,500 of the proposed 5,000 wells would be located on lands where CBM rights are owned by the federal government. The fee and state wells included in Alternative 1 are connected actions to the proposed federal wells. This alternative was developed by BLM in response to expressions of interest in CBM development within additional townships extending north of the northern boundary of the Proposed Action and additional townships located along the western boundary of the Proposed Action. The area covered by Alternative 1 would total approximately 3,600 square miles (2,317,000 acres).

The overall approach and technical procedures for CBM development under Alternative 1 would be the same as described previously for the Proposed Action. Alternative 1 also would consist of those components described in detail for the proposed Action: a) road access for drilling operations; b) drilling operations; c) well production facilities; d) electrical distribution lines; e) power generation; f) production pods; g) pipelines (gas gathering system, produced water gathering system and discharge facilities, gas delivery system); and h) pipeline compression. Because the extent of development under Alternative 1 would be greater than the Proposed Action, the extent of activity and disturbance would be proportionally increased, with the exception of gas compression.

Comparable quantities of compression facilities would be anticipated under the Proposed Action, Alternative 1, and the No Action alternative, as the Companies' field-wide plans for orderly development of CBM resources in the PRB are initiated. The Companies' field-wide compression plans, currently under development, are not constrained by the scope of this EIS analysis and the number of productive wells under consideration here. The compression facilities that would adequately handle the gas volumes anticipated as CBM development continues were estimated in Table 2-1. Potential surface disturbance associated with CBM development under Alternative 1 is shown in Table 2-2.

Anticipated Level of Activity and Project Life

The estimated productive life of the project is 12 to 17 years, as the first wells drilled would no longer by productive after 12 years. The last wells drilled at the end of a five-year initial development period would no longer be productive after 17 years. The estimated project life of the drilling phase is 3 to 5 years. APDs for federal wells would be approved by BLM. Twenty companies may have CBM development projects operating concurrently within the expanded project area. Approximately 50 to 400 wells per year may be drilled by each company. The minimum number of drilling rigs required to drill 800 to 1,000 wells annually would be 24 rigs conducting drilling or completion operations concurrently for an estimated 200 to 300 days within a calendar year (the estimated period when weather and soil conditions are suitable for access to the well location and drilling or well completion operations). It is likely that the Companies would utilize an estimated 50 drilling rigs to allow for poor weather conditions, mechanical problems, and scheduling concerns.

The hydrologic monitoring and mitigation and prescribed activities defined for the Proposed Action also would be implemented under Alternative 1. The offer of the Water Well Agreement (Appendix D of the DEIS) to affected surface owners would be required before federal APD's would be approved.

NO ACTION ALTERNATIVE

CBM production would be established from an estimated 2,000 coal bed methane wells drilled within the project area, excluding lands with federal CBM ownership. There would be no federal action involving federal CBM wells within the project area that do not address the potential drainage of federally-owned CBM resources. Construction and operation of compressors would be required to move gas to the transmission pipelines. Drilling would occur over a five year period with potentially productive non-federal wells being added each year.

These wells would be drilled anywhere within the project area evaluated under the Proposed Action (2,400 square miles), but only on lands where the CBM mineral estate is not federally owned. Approximately 50 percent of the project area (1,200 square miles) contains lands with federal oil and gas ownership. The remaining 1,200 square miles (approximately) of the project area would be available for drilling under the No Action Alternative. The average well density for new non-federal wells that are likely to be drilled under the No Action Alternative is estimated to be 0.8 well per square mile. Additional information is contained in Table 2-1.

Federal surface lands administered by the BLM or FS would not be expected to be affected by disturbance related to CBM drilling, since CBM drilling on lands where the oil and gas estate is federally owned would not be allowed under the No Action Alternative unless potential drainage of federal CBM resources were identified by BLM. Some federally-administered lands may be affected by disturbance related to installation of production facilities or pipelines for private wells drilled under the No Action Alternative. The nature of the disturbance would be similar to the disturbance proposed under the Proposed Action and Alternative 1 (Table 2-2).

The No Action Alternative is defined as the rejection of all applications for federal wells that do not involve potential drainage of federally-owned CBM resources. The CEQ regulations at 40 CFR 1502.14(d) require that alternatives analysis in the EIS "include the alternative of no action." The Secretary of the Interior's authority to implement a No Action Alternative is limited. Following is an explanation of this limitation and the discretion the Department has in this regard.

An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the federal lease. Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.

Leases within the project area for the Wyodak CBM Project EIS contain various stipulations concerning surface disturbance, surface occupancy, and limited surface use. In addition, the lease stipulations provide that the authorized representative of the Department of the Interior may impose "such reasonable conditions, not inconsistent with the purposes for which the lease is issued, as the BLM may require to protect the leased lands and environment." None of the stipulations imposed would empower the Secretary of the Interior to deny all drilling activity because of environmental concerns where leases have been issued with surface occupancy rights.

Provisions that expressly provide Secretarial authority to deny or restrict lease development in whole or in part would depend on an opinion provided by the U.S. Fish and Wildlife Service (USFWS) regarding impacts to endangered or threatened species or habitats of species that are listed or proposed for listing (for example, bald eagle). If the USFWS concludes that the Proposed Action and alternatives would likely jeopardize the continued existence of any endangered or threatened plant or animal species, then CBM development, including APD(s) and related Sundry Notices, may be denied in whole or in part on the affected federal leases.

Regardless of development of federal minerals, development would likely proceed on private and state leases. Under these conditions, the No Action Alternative would likely consist of drilling, completing, and operating as many as 2,000 additional productive wells, 1,000 fewer wells than the Proposed Action, in the eastern PRB. The additional wells would be not be located within the federal CBM mineral estate; wells would be located only on lands having private or state CBM mineral ownership. As development of the private and state-owned CBM mineral estate is not subject to federal approval or the NEPA process, no boundary can be assigned for activities occurring on non-federal mineral estate. For the purpose of comparative analysis, the estimated 2,000 additional wells developing private and state minerals would be located within the Proposed Action project area boundary (Map 2-1 and Tables 2-1 and 2-3).

ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

A number of additional alternatives to the Proposed Action were considered for the Wyodak CBM Project but were not carried through the full analysis in this EIS for various reasons. These alternatives and the reasons they were not considered to be feasible are listed below.

Restrict Timing on Approval of Federal Wells

This alternative considered slowing the rate of approval for the estimated 1,500 federal wells included in the Proposed Action. It was not analyzed in detail because there is enough flexibility in implementing the Proposed Action to regulate the timing of approval for the estimated 1,500 federal wells. The decision to approve each well is based on the site-specific analysis completed for each APD. The rate at which federal wells are approved could be slowed down, but the mix of mineral ownership in the project area would lead to proportionally more wells being drilled on private and state leases to make up for the reduced number of federal wells approved. This could lead to drainage of gas from the federal CBM mineral estate.

Reduce the Number of Federal Wells Approved

This alternative considered the drilling of fewer than 1,500 federal wells. It was not analyzed in detail because there is enough flexibility in the implementation of the Proposed Action to approve fewer than 1,500 federal wells. Approving fewer than 1,500 federal wells could lead to drainage of federal gas as discussed above. The decision to approve each well is based on the site-specific analysis completed for that well's APD.

Inject Produced Water Underground

Underground injection to dispose of the produced water was considered as an alternative. Produced water from existing projects has been of relatively good quality. Total Dissolved Solids (TDS) levels have averaged 764 mg/l TDS for CBM water discharges reported to WDEQ (WDEQ, 1998a), well within Wyoming standards for livestock water. However, underground injection of produced water currently is being researched as a disposal and/or aquifer enhancement option, but is not a viable alternative at present.

Disposal of produced water in Wyoming currently is limited to aquifers exempt from the definition of fresh and potable water (WOGCC, 1998b). Injection of this water into an exempt formation, as allowed under current regulations, potentially would make water now suitable for irrigation and livestock unsuitable for any future use. This action would mitigate potential surface water impacts but would create additional potential groundwater impacts.

Injection requires that the receiving formation be capable of accepting the quantity of water being injected. Injection of CBM produced water into the Wasatch Formation above the coal seam has not been tested. Injection into aquifers within the Tullock Member of the lower Ft. Union Formation has been studied by the City of Gillette with encouraging results. Injection into the coal seam would defeat the purpose of removing water from the coal seam to produce methane. Also, injection would require a system of wells and pipelines that would increase the total surface disturbance. Finally, because the produced water is suitable for livestock, wildlife, and possibly irrigation, surface disposal allows it to be put to subsequent beneficial uses.

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PROGRAMMATIC MITIGATION PLAN COMMON TO THE PROPOSED ACTION AND TO ALTERNATIVE 1 (PREFERRED ALTERNATIVE)

Mitigating measures that would be required on federal minerals, if applicable site-specifically, at the APD/POD level of analysis under the Proposed Action and Alternative 1 are compiled below as a programmatic mitigation plan for CBM development. These mitigating measures also are described in various sections of Chapter 4 of the DEIS, where they are incorporated within the resource impact analyses. Requirements that are Standard Conditions of Approval for CBM APDs are described in Appendix B.

Geology and Minerals

- **Methane will be controlled through APD conditions of approval that address well control, casing, ventilation, and plugging procedures appropriate to site-specific CBM development plans.**

Surface Water

Mitigation measures in the form of water management plans will be developed and applied as a cooperative effort at the APD/POD level of analysis, on a site-specific basis or under a Plan of Development (POD) on a project-level basis (Appendix B). This effort will include the agencies with jurisdiction (the BLM, FS, COE, WSEO, WOGCC and/or WDEQ) in consultation with the involved land managers and conservation districts, operators, landowners, and nearby downstream interests, including users of waters and landowners affected by impacts of increased flows on access, ranching, or mining operations. The cooperative efforts of all stakeholders will be necessary in developing water management plans that identify mitigating measures for areas or drainages where high CBM generated flows are or could be impacting existing uses. Some of the measures that could be applied at each site include:

- **Produced water may be dispersed in the upper reaches of drainages through the installation of stock tanks.**
- **Produced water may be transported to distant discharge points, which could require the use of water disposal pipelines that are more than one-half mile long.**
- **Produced water will be discharged into existing stream channels, reservoirs, stock ponds, and stock tanks in a manner that will not cause increased or accelerated erosion. This has been done effectively in past CBM projects by using energy dissipators at discharge points and by discharging into channels that are well developed and large enough to handle the increased flows. Energy dissipation can be achieved through the use of rock, placement of concrete control structures and/or the establishment of hydrophytic vegetation.**
- **Discharge points will be located to minimize spring flooding of fields.**

- **Discharge outfalls may use alternative outfalls for use with irrigation, as agreed upon by operator and landowner or lessee.**

- **To handle total flows with the addition of CBM produced waters, existing downstream culverts on lease will be replaced should flows exceed culvert capacity. New culverts and/or low water crossings will need to be sized considering total flows. Off lease, it is recommended that the operator work with other operators and with surface owners in the same drainage to replace downstream undersized culverts that would be affected by their discharge.**

- **Discharges will be limited to a volume less than or equal to the naturally occurring mean annual peak flow (which is roughly equivalent to a peak generated by a 2-year, 24-hour storm) and which can be handled by the natural channel under anticipated conditions.**

- **Local springs will be identified, and construction will be avoided in these areas.**

- **Discharge into playas will be avoided unless issues related to potential wetland creation, maintenance of discharge facilities, reclamation, and accountability are agreed upon by the operator and landowner or lessee.**

- **Discharge points will be selected in stable channels or reservoirs away from any significant downstream headcuts or other major erosional features. Outfall design may include discharge aprons and downstream stabilization of channel side slopes to prevent erosion and provide energy dissipation.**

- **Discharge facilities will be designed site-specifically using best management practices, to accommodate livestock access to water, to control erosion, and to limit sedimentation.**

- **Irrigation diversions to increase channel length and in-stream impoundments will be established, as appropriate, and as agreed upon by the operator and landowner or lessee.**

- **Downstream impoundments may need new or redesigned outlet works in order to handle the steady inflow provided by CBM discharge water.**

- **As per State of Wyoming effluent limitations and monitoring requirements contained in approved permits, and BLM or FS monitoring requirements contained in approved monitoring plans, volume and water quality parameters will be monitored at discharge sites by CBM producers. Monitoring also will occur at selected stations or downstream points of compliance on the Little Powder, Powder, Belle Fourche and Cheyenne Rivers and/or their tributaries.**

- **The areal extent of surface disturbance and the length of time that the area will remain disturbed before interim or final reclamation activities commence will be minimized.**

- Interim and final reclamation of all disturbed areas will proceed in a timely manner. Reclamation activities will be conducted during time frames established by federal land management agencies, landowners and affected interests.

- Reclamation must produce a natural appearance and must be consistent with site conditions, area management standards, and projected uses, as agreed upon by the operator, landowner or lessee, and appropriate state and federal agencies.

- Reclamation will include, as appropriate, recontouring, establishment of desirable, perennial vegetation, stabilization and erosion control of all disturbed areas. Additional measures, such as topsoil conservation, temporary fencing, mulching, or weed control will be utilized, as appropriate, to ensure long-term vegetative stabilization of all disturbed areas. Reclamation standards will be agreed upon by the operator, landowner or lessee, and appropriate state and federal agencies.

- A water management plan must accompany each plan of development for federal wells and must address all potential CBM development in a watershed area, regardless of surface and mineral ownership (Appendix B).

- At the discretion of the surface owner, dams can be removed and the impoundment area reclaimed after the produced water is no longer available.

- Design and siting of discharge facilities must be carefully controlled or limited where channels are not stable, armored, or large enough to accommodate the flows that would be anticipated.

- Design and location of discharge points must be carefully controlled or limited or localized flooding may occur with increased frequency and magnitude where channel or basin capacity is insufficient to handle increased flows.

- Potential impacts to spring flow, specially those related to scoria aquifers like the one feeding Moyer Springs, can be analyzed site-specifically, as needed, during review of APDs/PODs or Sundry Notices, and impacts mitigated through the application of special conditions of approval for drilling or production operations.

- The quality of discharged waters can be protected through the application of special conditions of approval that provide for the careful location and design of discharge facilities in the vicinity of improved water bodies.

- The feasibility of designing surface water discharge facilities that could prevent increased sediment loads from reaching the affected segments of the Belle Fourche drainage having curtailed beneficial uses will be analyzed site-specifically.

- **Timely recontouring and revegetation of disturbed areas can be required to limit runoff from disturbed areas that could cause sediment concentrations in surface waters to rise over present levels.**

- **Additional surface water monitoring sites will be established in order to collect information related to surface water characteristics, flow regimes, substrates, and aquatic habitats. Monitoring related to specific habitats, such as those of the sturgeon club, will be incorporated within monitoring plans at the site-specific APD/POD level of analysis where suitable existing habitat may be affected by CBM activities.**

Groundwater

- **A standard agreement has been developed by CBM operators and landowners to monitor and mitigate water well impacts caused by CBM operations.**

Air Quality

- **Air quality issues related to stationary sources of air pollution will be addressed in accordance with the authorities of the WDEQ. Air quality issues related to mobile sources of air pollution will be addressed in accordance with the authorities of the EPA. Visibility impairment within federally mandated Class I areas will be addressed in accordance with federal regulations on regional haze. Visibility impairment at other Class I and sensitive Class II areas will be addressed accordance with the recommendations from interagency and stakeholder coordinating groups.**

- **At the discretion of the surface owner, and in accordance with permitting decisions made by the WDEQ, compressors and compressor stations should be sited to avoid sensitive surface resources and potential conflicts with other uses.**

- **Under the regulatory authority of the WDEQ and at the discretion of the landowner and the CBM operator, the implementation cost and effectiveness of electrification of compressors and other BACT will be considered.**

Soils

- **Accelerated soil loss will be minimized by limiting the following: the removal of vegetation; the leveling of work areas; and the location of wells on slopes that require cuts-and-fills for well pad construction.**

- **Timely initiation of reclamation and revegetation efforts will be required to effectively and immediately control accelerated soil loss due to either wind or water erosion.**

- Road construction that requires cuts-and-fills will be minimized. Pipeline construction also will avoid steeper slopes where possible. Where necessary, erosion control features, such as water bars or other means of diverting flows off sloping pipeline rights-of-way, will be constructed to control increased runoff and erosion.

- Areas of highly erosive soils will be avoided when drill sites, two-track access routes, and pipeline routes are surveyed and staked, in order to substantially reduce the amount of soil loss.

Vegetation Resources

- Reclamation and final closure of the proposed operations will re-establish vegetation suitable for forage and wildlife habitat in the disturbance areas.

- Actions that will enhance restoration of vegetation productivity from desirable species include the following site preparation and reclamation techniques: mechanical loosening or roughening of the soil where compacted (discing or ripping); fertilization or soil amendment; seeding to proper depth with desirable species; mulching to retain soil moisture; transplanting containerized plants to speed the establishment of slow-growing species; control of noxious weeds; or temporary fencing to exclude livestock until vegetation is re-established successfully. These actions will be required, as appropriate.

- Mitigation activities most effective in reducing the potential for decreased vegetation production include timely and well planned reclamation and effective noxious weed management, avoidance of disturbance within playas (old lake beds), and avoidance of discharge within closed basins, playas, and areas with soils that would be difficult to revegetate. These mitigation activities will be required, as appropriate.

Wetlands

- For any jurisdictional wetlands identified that may be impacted, a detailed mitigation plan would be developed during the APD/POD or Sundry Notice approval process. Federal requirements to replace all impacted wetlands would mitigate this loss, so environmental impacts would occur only during the life of the project (including reclamation).

- The State of Wyoming Department of Environmental Quality, Water Quality Division administers a State Wetland Bank. Landowners have the opportunity to "bank" newly created or expanded wetland areas. While banking provisional wetlands from CBM discharges does serve to record the existence or non-existence of prior non-wetland status, there is no temporary mitigation. Wetlands used for mitigation purposes become jurisdictional and must be maintained in perpetuity. If wetland characteristics are lost due to inadequate hydrology, or other factors, then the banked credit is lost.

- **Mitigation activities most effective in reducing the potential for adversely impacting existing wetlands include the following: avoidance of discharge within playas and closed basins; avoidance of discharge within or near existing wetlands (if increased discharge volumes or subsequent recharge of shallow aquifers would inundate and kill woody species, especially willows or cottonwoods); and avoidance of disturbance within all delineated or recognized wetlands.**

- **At the discretion of the surface owner, fencing of wetlands and providing off-site watering for livestock could be used to allow vegetation development and maintenance of water quality in key wetlands. Any fences used should be placed well back from the wetlands to prevent waterbird mortalities and should be constructed to standards that allow big game movement.**

- **If possible, wetlands and ponds will be built on accessible public lands where recreational users can benefit from the development.**

Wildlife

- **All power lines will be built to protect raptors from accidental electrocution.**

- **Power line corridors will avoid wetlands, to the extent possible, in order to reduce the chance of waterfowl hitting the lines.**

- **At the discretion of the surface owner, several small ponds could be consolidated into one larger pond in order to provide more open water and a longer shoreline at one site, which may be more beneficial to wildlife.**

- **The appropriate standard seasonal or year-long stipulations for raptors, sage grouse, and big game, as identified by the BLM's Resource Management Plan, will be applied.**

- **Roads will be constructed to the minimum standard needed, so that disturbance to soil and vegetation on each road would be minimized.**

- **Fences along service roads will be avoided unless absolutely necessary, in order to prevent a maze of barriers to big game movements. Fences will be constructed to standards that allow for easy big game passage, in order to avoid big game entanglements.**

Fisheries

- **At the discretion of the surface owner, several small ponds could be consolidated into one larger pond that may have the characteristics needed to support a fishery.**

- **At the discretion of the surface owner, reservoirs developed as part of CBM activities could be sited within natural stream courses, to provide benefits to fish and wildlife resources.**

- **Under the authority of the WDEQ, CBM produced water and receiving waters should be analyzed before wetlands, ponds, or lakes are formed or expanded. Selenium levels that would cause adverse effects in fish or waterfowl should be not be present.**

Special Status Species

- **Surveys for nesting mountain plovers are recommended if ground disturbance (wells, roads, pipelines, etc) of the proposed project occurs between May 1 and June 30.**

- **Special habitats for raptors will be analyzed site-specifically during the review of the APD/POD or Sundry Notices. A minimum disturbance-free buffer zone of one-half mile will be established for all raptors during the nesting season (February 1 through July 31), in accordance with the BLM's Resource Management Plan for the area. Enlarged disturbance-free buffer zones will be established for specific species, as appropriate, at the APD/POD level of analysis.**

- **Prairie dog towns will be surveyed for the presence of black-footed ferrets if the towns meet USFWS guidelines. Disturbance in prairie dog towns will be avoided or minimized, to protect sensitive species such as the burrowing owl.**

- **A disturbance-free buffer zone of one-quarter mile is established around a sage grouse lek to reduce the likelihood that proposed activities will disrupt breeding and nesting activities. A seasonal timing restriction will extend outward for another 1¾ mile from the one-quarter mile buffer-free zones applicable during February 1 through July 31.**

- **At the discretion of the surface owner, native species will be planted to re-establish special habitats.**

Cultural Resources

- **All areas of proposed ground disturbing activity will be inventoried for cultural resources at the APD/POD or Sundry Notice phase of each action.**

- **Specific plans for avoidance or data recovery will be recommended for any significant sites within the area of potential effect of the proposed activities.**

Land Use and Transportation

- **If CBM development activities are proposed in the vicinity of scattered subdivisions near Gillette, site-specific mitigating measures will be developed to minimize the impacts and to resolve conflicts.**

- Over the project life, uneconomic and depleted wells will be plugged and abandoned, and the disturbance reclaimed and revegetated to approximate pre-project conditions.

- Reclamation and final closure of the proposed operations will re-establish the land uses of grazing and wildlife habitat in the disturbance areas.

- CBM facilities such as production pods or compression facilities will be fenced as specified by the BLM. Access from properties adjacent to production pods or compression facilities may be restricted by this fencing.

- Roads and facilities no longer needed will be removed and the affected area will be rehabilitated.

- Where feasible, each access road will be constructed in a transportation corridor that will also include gas and water pipelines, and electrical cables.

Visual Resources

- Gathering lines, water lines, high pressure gas lines and underground electrical cables would be located along road rights-of-way whenever feasible.

- Long-term visual impacts will be minimized by designing permanent structures to harmonize with the surrounding landscape to the extent feasible, recontouring and revegetating disturbed areas no longer needed for operations as soon as practicable, and by reshaping straight edges of clearing resulting from roads, pipelines, well pads, and compression facilities to create irregular or indistinct edges.

- Proposed facility developments on BLM-administered federal surface would be consistent with BLM management objectives for mapped VRM classes.

- All proposed wells and facilities on FS-administered federal surface would be consistent with FS Visual Quality objectives for the Thunder Basin National Grassland. Adverse visual impacts would be minimized through careful location of facilities, minimal disturbance of affected sites, and design of facilities so that they harmonize with the surrounding landscape.

- Use of two-track and existing roads and centralization of gas compression facilities along existing roads will minimize the visual impact of the road network.

- The use of buried power lines to each well, where feasible will reduce the linear element in the landscape.

- Construction debris will be removed immediately, as it creates undesirable textured contrasts with the landscape.

[illegible] proposed for [illegible] road construction, rehabilitation [illegible] will be implemented during the approval of APDs and [illegible]. These measures also would mitigate impacts to visual quality.

blading.

Compressors should be located at least 500 feet from sensitive receptors (residences, schools, medical facilities, and recreation areas). Under current Wyoming law, the WDEQ can only require this mitigation to occur if municipal or county land use plans address siting of noise emitters.

GROUNDWATER

Most groundwater resources historically were developed from two aquifers: Quaternary alluvial aquifers adjacent to stream and rivers; and within the lower Tertiary Wasatch/Fort Union. Deeper, underlying regional aquifers include the following: the Upper Cretaceous Lance/Fox Hills; the Lower Cretaceous Dakota; and the Paleozoic Madison. These units represent the majority of the significant water-bearing strata; however, there are a few wells completed in formations that are included in "aquitard" groups. These wells typically have lower yields that are of poorer quality except near the outcrop. In addition to water supplies that can be developed from these aquifers, there are a few springs typically of the contact type, often at the base of exposed clinker. A generalized description of the Wasatch/Fort Union geology of the area is shown in Table 3-1 of the DEIS.

The prediction of groundwater movement and chemical quality in the PRB can be complex and locally variable. Local leakage between aquifers can occur as a result of faulty well completion techniques and corrosion of casing in old wells where poor quality water initially was cased off (USGS, 1974). In addition, the PRB has been drilled extensively in the course of mineral exploration; inconsistent plugging of test holes also is a potential concern. Commingling of aquifers could occur to some degree within the study area.

The Wasatch/Fort Union aquifer group includes the Wasatch Fm and the Tongue River (which includes the Wyodak coal), Lebo, and Tullock members of the Fort Union Fm. Discontinuous sands and shales form the top of this sequence. It is underlain by the Wyodak coal, the source of the coal bed methane for this project. The thickness of the shallowest of the bedrock aquifer systems in the PRB ranges to over 3,000 feet (Feathers et al., 1981).

Alluvial Aquifers

Alluvial aquifers consist of unconsolidated sand, silt, and gravel that underlie floodplains and the adjacent stream terraces. Thicknesses are usually less than 30 feet. Alluvium overlying Tertiary sediments (Fort Union and above) in the central part of the PRB is mostly fine-to medium-grained sand and silt. Coarser deposits occur in the valleys of the Belle Fourche, Cheyenne, Powder, and Little Powder rivers (USGS, 1973). Water yield from the alluvium is a function of grain size and grain-size distribution. Recharge results from surface infiltration and discharge from underlying strata. Local groundwater movement dominates in these systems; movement is along the drainage in a downstream direction.

Alluvial groundwater levels in Donkey and Stonepile Creeks, in the City of Gillette, are shallow and close to the ground's surface (Appendix E, Letter No. 22). The City of Gillette pumped approximately 4.7 gpm for total of [illegible] gallons in June [illegible] from [illegible] daily. Pumping occurs throughout the year. Water levels rise during the summer lawn-watering period.

Water quality in alluvium within the PRB is quite variable, with TDS concentrations varying from 100 to over 4,000 mg/l. Common ranges are from 500 to 1,500 mg/l (USGS, 1973). Analyses from eight wells completed in alluvium within the study area have TDS concentrations averaging 2,232 mg/l, and varying between 467 and 5,610 mg/l. Most waters have calcium or sodium as the dominant cation and sulfate as the dominant anion. An area of sodium bicarbonate alluvial groundwater exists in the northeast portion of the study area (USGS, 1973).

Wasatch Aquifer System

The Wasatch aquifer consists primarily of fine- to medium-grained lenticular sandstone beds and sand channels surrounded and interbedded with siltstone, shales, and coals. The thickness increases from east to west from zero at the eastern boundary of the study area to over 1,000 feet at the western limit of the study area. Wasatch shales and siltstones generally do not yield enough water even for intermittent livestock use.

Wells completed in sandstone lenses or sand channels yield 10 to 50 gpm (approximately 0.02 to 0.1 cfs) in the northern portion of the study area. Wells completed near the southern portion of the PRB can yield as much as 500 gpm, which is approximately equivalent to 1 cfs, (USGS, 1988). Artesian conditions are common away from the outcrop particularly from deeper isolated sands. Recharge to the Wasatch Fm is through surface infiltration of precipitation and lateral movement of water from adjacent clinker and alluvium.

Natural discharge occurs at small seeps and springs along surface drainages. Local flow systems are predominant with discharge occurring along creeks and tributaries near recharge areas. Regional groundwater movement, if it exists, is toward the north but is extremely slow due to the fine-grained and discontinuous nature of most of the Wasatch sands.

Water types within the Wasatch Fm are predominantly sodium sulfate and sodium bicarbonate. There are some calcium or magnesium sulfate waters found in the eastern portion of the study area (USGS, 1973). Dissolved solids concentrations in 257 samples acquired from the Wasatch vary between 227 and 8,200 mg/l, have a median concentration of 1,010 mg/l, and have an average concentration of 1,298 mg/l (USGS, 1986c). Analyses from approximately 143 wells completed in the Wasatch Fm, located in and near the study area, vary between 146 to 8,200 mg/l dissolved solids and have an average concentration of 1,415 mg/l (USGS, 1984).

Selenium concentrations can pose water quality risks in Wyoming. Geochemically, the primary source for selenium is volcanic emanations associated with volcanic activity. Sources of selenium in the study area are associated with secondary sources located in biological pools in which selenium has bioaccumulated (NAS, 1974). Shales have the highest concentration of selenium and are the primary source for selenium in the PRB (ASSMR, 1995).

Analysis of trace metals was conducted for approximately 33 wells completed in the Wasatch Fm (USGS, 1984). Selenium concentrations in groundwater range from below the analytical method detection limits in 32 of the samples to 0.02 mg/l (USGS, 1984). The Quality Standards for Wyoming groundwaters identify acceptable concentrations of selenium for domestic, agriculture and livestock use as 0.01 mg/l, 0.02 mg/l and 0.05 mg/l, respectively. The detection limit in a number of the samples (1 mg/l) was greater than the standards. Selenium exceeded the drinking water standard in 4 of 159 samples compiled from the Powder River coal field. Dissolved selenium concentrations, ranging from 0.003 to 0.330 mg/l, reported in Selenium: Reclamation and Environmental Impacts, Special Symposium June 1995, have been recognized in shallow post mining groundwater (spoils) from coal mines in the PRB (USGS, 1988 and Naftz and Rice, 1989). The selenium concentrations in these areas probably result from exposure of crushed Wasatch Fm overburden materials to oxidizing conditions. Oxidizing conditions decrease the stability of selenium-containing oxides and organic matter, resulting in increased selenium concentrations within backfill materials and waters discharging from them (ASSMR, 1995).

Fort Union Formation

The Fort Union Fm. has been divided into three members: the Tongue River (which includes the Wyodak coal); Lebo; and Tullock. In the southern part of the basin the Lebo and the Tongue River are not identified as separate members.

Tongue River Member

The Tongue River Member of the Fort Union Fm contains seven to nine major coal seams (USGS, 1986a), and many discontinuous, lenticular sandstone layers. The Wyodak coal bed occurs in the upper part of the Tongue River Member. It has been correlated in many parts of the PRB and has been given different names in different parts of the basin. The coal bed has been called the Wyodak-Anderson or the Wyodak-Canyon coal bed. North of Gillette, the Wyodak coal bed splits into Upper Wyodak and Lower Wyodak coal beds. In places, the Upper Wyodak separates into the Smith, Swartz, and Anderson coal beds, and the Lower Wyodak separates into the Canyon and Cook coal beds. South of Gillette, the Wyodak occurs as essentially a single coal seam that may have a number of thin splits within it. South of Wright, in the vicinity of the Antelope mine, the Wyodak separates into the Anderson and Canyon coal beds. Coal beds equivalent to the Wyodak are tentatively correlated in the vicinity of Sheridan on the western side of the PRB. Recent work by the USGS indicates that the Wyodak combines with other coals to form a 200-ft thick coal seam known as the Big George at a depth of over 1,000 feet in western Campbell County. For ease of reference in this report, the main coal seam that is the target of CBM development will be referred to as the Wyodak, and where it splits into two distinct seams they will be referred to as the Upper and Lower Wyodak.

The Wyodak coal occurs at the top of the Fort Union sequence and is the most continuous hydrogeologic unit in the study area. Away from the outcrop, water in the Wyodak coal bed is confined between a basal shale of the overlying Wasatch Fm and a thick shale sequence underlying the coal bed (USGS, 1988). The determination that the coal is a confined aquifer away from the outcrop is further documented by the USGS (1986c) and in various mine permit application packages (PAPs) on file with the WDEQ/LQD. Artesian conditions exist away from the outcrop. The aquifer consists of the Wyodak and associated coals. Where the Wyodak splits and separates into multiple seams, it contains interbedded sandstones, and clinker beds. Flow of water in the aquifer is affected in places where the coal seam splits and is interbedded with claystone, shale, and sandstone. Flow in the aquifer also is affected by differences in aquifer properties, caused by a varying pattern and degree of fracturing in the coal and by faulting. The permeability of the coal-bearing bed is a function of fracturing. The coal is anisotropic (not uniform), and the flow occurs in fractures within the coal. Wells completed within coal generally yield from 10 to 50 gpm (approximately 0.02 to 0.1 cfs) (USGS, 1975).

Recharge occurs primarily along the clinker outcrop areas with a small amount of leakage from the overlying Wasatch Fm. Recharge and discharge also occur locally, where coal underlies valley fill deposits (USGS, 1988). As more operating mines are reclaimed, reclaimed mine areas may become recharge areas for adjacent, undisturbed Wyodak coal. Regional flow is to the northwest and away from the recharge areas, as indicated by the potentiometric surface map prepared by Daddow (USGS, 1986b). In the southern portion of the study area, water flow is to the north, moving toward local discharge areas where Antelope and Porcupine Creeks cross coal outcrops (USGS, 1988). Local flow patterns may differ from regional flow.

Available data suggest that near-surface Fort Union wells do not show a dominant water type but consist primarily of calcium or magnesium sulfate water. As depth increases below 100 feet, sodium replaces calcium and magnesium and bicarbonates replace sulfates. The predominant water types of existing water wells within the Fort Union Fm consist primarily of sodium bicarbonate and to a lesser extent sodium sulfate (USGS, 1973). Wells penetrating coal seams or other carbonaceous deposits often yield both water and gas (primarily methane).

Solute concentrations within the Fort Union Fm are variable. The average concentration for 73 samples in the study area from the Fort Union Fm is approximately 1,350 mg/l (USGS, 1984). The best quality water typically is obtained from clinker areas. Water from coal beds typically contains 1,000 to 2,000 mg/l TDS (USGS, 1974). The quality of water contained in the coal seam is described in various coal mine PAPs and annual monitoring reports on the file with WDEQ/LQD, and was summarized by the USGS (1988). Based on 379 samples from the Wyodak-Anderson coal aquifer, the median concentration of TDS is 1,310 mg/l. Baseline data from the Rocky Butte Mine lists average TDS concentrations of 1,210 and 2,120 mg/l, reported by Carter and Wyodak, respectively (USDI BLM, 1992f).

Produced water contains an average (mean value) of 764 mg/l Total Dissolved Solids (TDS), based on discharge monitoring report data for 577 CBM effluent (discharge) samples reported to WDEQ between 1/31/93 and 12/31/97 (WDEQ, 1998a) (Table 3-1). Specific conductance of water from 32 discharge points in the Marquiss and Lighthouse CBM fields averaged 560 mg/l (ranging from 375 to 710 mg/l for 153 samples, assuming TDS is roughly equivalent to 0.667 times the specific conductance (USDI BLM, 1991). Available monitoring results are not very conclusive as to whether TDS levels within discharged CBM waters vary geographically in any pattern.

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Preliminary analysis of monitoring results reported to WDEQ suggests that TDS levels may be higher in some northern portions of the study area than levels observed within the Marquiss and Lighthouse areas south of Gillette. These CBM monitoring results also suggest that reported TDS levels in discharged CBM waters are lower than solute concentrations that typically have been documented within the Ft. Union Fm (see above).

Analysis of trace metals was conducted for approximately 31 wells completed in the Fort Union Fm (USGS, 1984). Selenium concentrations in groundwater range from below the analytical method detection limits in 29 of the samples to 0.020 mg/l. However, the detection limit in all of the samples was above the most stringent guidelines within the Quality Standards for Wyoming Groundwaters (0.01 mg/l).

Table 3-1
Statistical Summary of WDEQ Discharge Monitoring Report Data(12/31/83 - 12/31/87)

	Flow		EC	TDS[1]	pH	Radium 226	TPH
	mgd	gpm	µmhos/cm	mg/l	S.U.	pCi/l	mg/l
Mean	0.05	34.6	1146	764	7.2	<0.44	<0.529
Standard Error	0.0028		22.70	22.70	0.014	0.0489	0.015
Median	0.02	23.3	992	662	7.2	<0.20	0.500
Minimum	0.00	0.0	110	73	5.7	<0.20	0.000
Maximum	1.14	791.5	6380	4255	8.7	10.60	8.400
Count	569	569	577	577	580	350	576.000
Confidence level (0.95)	0.0055	0.0055	44.49	44.49	0.028	0.0959	0.029

[1] TDS values derived from multiplying conductivity values by 0.667.

Source: WDEQ, 1998a.

Table 3-2, after Lowry and others (USGS, 1986b), shows trace metal concentrations in groundwater within Coal Area 50, the PRB, which includes all of the study area. This table shows manganese and iron concentrations exceeding secondary domestic standards with some frequency, but also shows a median concentration for all samples acquired that is less than the secondary domestic standard. Water containing manganese and iron concentrations that have been measured in the study area can be used safely for irrigation or stock watering.

Lower Tongue River/Lebo Confining Layer

The lower part of the Tongue River/Lebo consists of sandstone lenses contained in a predominantly shale and siltstone matrix (USGS, 1988). Thick coal beds occur in the upper part of the Lebo Shale member (USGS, 1974). Wells in the lower Tongue River/Lebo unit typically yield adequate quantities of water for domestic and livestock use if a sufficient thickness of saturated sandstone is penetrated. The towns of Gillette and Wright, as well as many of the

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subdivisions surrounding Gillette, obtain most of their municipal water supply from wells screened within the sands of the lower Tongue River, Lebo and Tullock members of the Fort Union Fm (HKM Associates, 1996). The City of Gillette has recently installed seven new water supply wells screened in the lower Tongue River, Lebo and Tullock members (Wester-Wetstein & Associates, 1999b). Generally, these water supply wells are not screened through the upper part of the Tongue River, and are screened several hundred feet below the Wyodak Coal.

Table 3-2
Trace Metal Concentrations of Groundwater in Coal Area 80

Dissolved Trace Metal	Number of Analyses	Number of Analyses Exceeding Drinking Water Standards	Percent of Analyses Exceeding Drinking Water Standards	Drinking Water Standards (mg/l)	Median Value	Maximum Analyzed Value (mg/l)
Arsenic	154	1	0.6	0.05a	0.001	0.120
Barium	95	1	1.0	1.0a	0.00	1.100
Cadmium	165	1	0.6	0.01a	0.002	0.017
Chromium	116	0	0.0	0.05a	0.010	0.050
Copper	123	0	0.0	1.0b	0.001	0.104
Iron	366	56	15.3	0.3b	0.130	120.0
Lead	165	6	3.6	0.05a	0.002	0.180
Manganese	257	100	38.9	0.05b	0.040	4.800
Mercury	122	0	0.0	0.002a	0.0004	0.0015
Selenium	159	4	2.5	0.01a	0.001	0.031
Zinc	141	0	0.0	5.0b	0.020	1.800

Source: USGS, 1988.
a National interim primary drinking-water standards (USEPA, 1977).
b National secondary drinking-water regulations (USEPA, 1979).

The shales underlying the Wyodak coal act as a confining layer, providing partial isolation of the coal from underlying strata. Stratigraphically lower aquifers are partially isolated from impacts resulting from dewatering associated with mine activities and CBM production in the Wyodak coal aquifers. As with other Fort Union aquifers, recharge is primarily from inflow at outcrop areas. Groundwater generally flows north. Water quality for the Tongue River/Lebo is similar to that described above for the Wyodak coal aquifer.

Tullock Aquifer

The Tullock aquifer consists of fine- to medium-grained sandstone layers and thin coal seams interbedded with siltstone, shale, and carbonaceous shale (USGS, 1988). The sandstone layers in the Tullock tend to be somewhat coarser and more massive than the overlying Tongue River/Lebo members of the Fort Union Fm. In areas where the Lebo Shale is well defined, it provides a hydraulic separation between the Tullock and the coals of the upper part of the Fort Union Fm. The Tullock is exposed in the west along the Bighorn Uplift and in the east, east of the Little Powder River, in a series of dissected ridges (USGS, 1987). Water yields of 200 to 300 gpm (approximately 0.4 to 0.6 cfs) are available from the Tullock, making this zone attractive for municipal and industrial uses. Most wells for mine facilities are completed in this aquifer. Recharge to the Tullock results from leakage through overlying strata and infiltration along the outcrop areas.

Water Use

Groundwater consumption in the study area averages 28.84 million gallons per day or 32,300 acre-feet per year (Table 3-7 of DEIS) (USGS, 1998b). More than 40 percent of this consumption is in the Belle Fourche River basin. Mining-related withdrawals associated with pit dewatering and operational consumption account for 77 percent of the groundwater use in the study area. All water for domestic consumption is derived from groundwater supplied predominantly from the Fort Union and Wasatch aquifers. Over 90 percent of domestic consumption occurs in the Belle Fourche River basin, where most of the population resides. Stockwatering and irrigation uses of groundwater accounted for slightly more than one million gallons per day in 1990.

CBM water withdrawals were not significant in 1990, and therefore, are not included in the table. However, approximately 890 productive CBM wells are in place as of the end of 1998. Produced water from the Fort Union aquifer averaged 6.92 million gallons per day based on actual reported production from 420 wells, February 1998 (PI/Dwight's, 1998).

The Wasatch and Fort Union aquifers are the most important local sources of groundwater in the PRB (Feathers et al., 1981). They are developed extensively for shallow domestic and livestock wells. Domestic and livestock wells usually are low yield, (less than 25 gpm or 0.05 cfs), intermittent producers. Water suitable for domestic and livestock uses typically can be found less than 1,000 feet below the surface. Industrial water wells are used primarily to obtain water for use in subsurface injection that promotes secondary recovery of petroleum. At coal mines these wells are used for drinking water and dust abatement. Municipal water supply wells in the project area are predominantly associated with the City of Gillette's use of the Fort Union Fm. (Tongue River, Lebo and Tullock members). Municipal water use in Gillette has a winter base demand of 3.0 to 3.5 million gallons per day (gpd) and a peak demand of 10 million gpd (Wester-Wetstein & Associates, 1994). Peak demands for the Gillette area are projected to grow to 18.1 million gpd by the year 2020 (HKM Associates, 1994).

There are more than 10,000 WSEO-permitted water wells in and around the study area (T40-58 N R70-75W; T45-56N R76W; and T48-52N R77W) of which approximately 3,600 have been canceled or abandoned. Of the remaining approximately 6,900 wells, approximately 4,000 are monitor wells. The remaining approximately 2,900 wells are used for domestic, industrial, irrigation, municipal, reservoir and stock purposes. The water well location data for all permitted water wells in Wyoming is too lengthy to include in this document but is available from the Wyoming State Engineers Office (WSEO, 1998b and 1999). Table 3-3 summarizes groundwater use in the Wyodak study area in 1990.

Table 3-3
1998-1999 Data on Type and Number of Wells in the Wyodak Study Area
(T40-58 N R70-76 W; T45-56N R76W; and T48-52N R77W)

Primary Use	Number of Wells
Monitor, Miscellaneous, Dewater	**3,966**
Domestic	**510**
Industrial	**195**
Irrigation	**25**
Municipal	**28**
Reservoir	**22**
Stock (not including CBM)	**2,163**
Unknown	**16**
TOTAL	**6,925**

6/10/1998 and 2/1/99 Listings
Source: WSEO, 1998b and WSEO, 1999

DEIS CHAPTER 3 AFFECTED ENVIRONMENT ERRATA

Page No./Paragraph/Line	Errata
3-3, Table 3-1	The text under Formation should read "Upper Fort Union (Upper Tongue River/Wyodak Coal" instead of "Wyodak Coal" and should read "Upper Fort Union (Lower Tongue River) and Lebo" instead of "Upper Fort Union (Tongue River/Lebo)."
3-5 3 6	Insert the following sentence after the fifth sentence: "However, the development of CBM in the PRB is occurring under confined conditions (FEIS, p. 3-3)."
3-7 3 2	Insert the following sentence after the first sentence. "As of September 1, 1999, 2,373 CBM wells had been drilled of the 3,890 active APDs in the Wyodak Study area (WOGCC, 1999c)."
3-8 4 2 and 3	Delete the last sentence of the fourth paragraph.
3-11, Table 3-4	Replace Table 3-4 of the DEIS with the revised Table 3-4 occurring on page 3-11 of the FEIS.
3-10 3 1	The text should read "1)Wyoming's Belle Fourche River (77 percent of CBM generated flow); 2) Little Powder River, WY and MT (19 percent of CBM generated flow); and 3) Wyoming's Cheyenne River (4 percent of CBM generated flow)."

Page No./Paragraph/Line	Errata
3-14 3	Insert the following paragraph, after the third paragraph: "The study area includes several streams which are designated for aquatic life: Little Powder River — Warm water fishery Class-2 Belle Fourche River — Warm water fishery Class-2 Rawhide Creek — Marginal fishery Class-3 Antelope Creek — Warm water fishery Class-2 Little Thunder Creek — Warm water fishery Class-2 The remaining tributaries are Class-4 waters, protected for only livestock and irrigation."
3-37 1 1	The text should read "..., and wetlands, including isolated wetlands, within the study area, are jurisdictional areas ..."
3-37 1 5	The text should read "... not an activity regulated by the COE if the activity does not include a discharge of fill material into waters of the U.S. (US Army COE, 1998)."
3-40 1 5	The correct dates for restricting disturbance are February 1 through July 31.
3-40 1 9	The text should read "... only 26 leks ..." Delete last sentence of paragraph, line 10.
3-40 2 6	The text should read "black bullhead (*Ameiurus melas*), ..."
3-40 2 10	The text should read "(*Scaphirhynchus platorynchus*), ..."
3-40 3 4	The text should read "... and, the endangered Ute Ladies'-Tresses (*Spiranthes diluvialis*). *The mountain plover* (*Charadrius montanus*), for which the USFWS changed its status from candidate to proposed, has been identified as potentially occurring within the area. In addition to the threatened and endangered species, two candidate species have been identified as potentially occurring with the area: the swift fox and sturgeon chub."

Page No./Paragraph/Line	Errata
3-40 1	Insert following paragraph after the first paragraph: "Limited existing information is available for use in characterizing aquatic habitats in perennial receiving waters, flow regimes, and unmitigated stream erosion downstream of the discharge points or the proposed discharge of CBM produced water. A comparison of 1990's and 1960's fish survey data from the Missouri River basin indicated that the sturgeon chub has a stable or increasing distribution (Patton et al, 1998). This survey was restricted to native warm-water species in non-mountainous regions. An estimated 40 to 50 percent of the fish species surveyed indicated a possibility of declining distributions (Patton et al, 1998). Two aquatic habitat types were common among the species with declining distributions indicated in the study: turbid rivers having silt and sand substrates; and small-to medium-sized streams having relatively cool, clear water, and preferably having gravel substrates for spawning. Patton et al (1998) suggested that reservoirs and diversion dams may have stabilized flows and reduced silt loads in rivers, and that land management and irrigation practices may have increased turbidity and siltation in many small- to medium-sized streams.
3-45, Table 3-16	The binomial for flathead chub listed in column one should read "*(Platygobio gracilis)*"
3-51 2 3	The text should read "Active coal mines located south of Gillette include Caballo (includes Rocky Butte), Bell Ayr, Cordero-Rojo Complex, Coal Creek, Jacobs Ranch, Black Thunder, North Rochelle, North Antelope/Rochelle, and Antelope.
3-51 4 1	The text should read "The study area has two major railroads and numerous oil and gas pipelines. The Burlington-Northern/Santa Fe and Union Pacific railroads pass through …"
3-56, Table 3-20	The Wyoming Valuation (first row) under Other Minerals (sixth column) should read "293 million"

Table 3-4
Predicted Storm Flows from USGS Gaging Stations[1]

Station Name	Station Number	Drainage Area (sq. mi.)	Flow					
			2-Year 24-Hour	5-Year 24-Hour	10-Year 24-Hour	25-Year 24-Hour	50-Year 24-Hour	100-Year 24-Hour
Powder River Basin								
Dead Horse Creek tributary near Midwest	06312910	1.53	223	386	524	733	917	1,130
Rucker Draw near Spotted Horse	06317050	3.98	84	335	696	1,530	2,570	4,100
Little Powder River Basin								
Little Powder River tributary near Gillette, WY	06324800	3.45	9	24	41	74	112	163
Little Powder River near Broadus, MT	06325500	2040	1,120	1,750	2,170	2,690	3,070	3,450
Belle Fourche River Basin								
Donkey Creek tributary above reservoir near Gillette, WY	06426195	0.2	37	65	99	152	198	249
Belle Fourche River below Rattlesnake Creek, near Piney	06426500	1690	797	1,740	2,770	4,720	6,830	9,660
Cheyenne River Basin								
Pritchard Draw near Lance Creek	06382200	5.1	610	1,160	1,660	2,450	3,180	4,030

[1] USGS 1988

USGS 1988. Streamflows in Wyoming. Prepared by H.W. Lowham. Water-Resources Investigations Report 88-4045. Prepared in cooperation with the U.S. Bureau of Land Management and the Wyoming Highway Department. Cheyenne, WY.

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CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

GROUNDWATER

In developing CBM, a portion of the water contained in the coal aquifer is removed at specific locations, releasing methane for collection. The primary groundwater impact associated with development of the Wyodak CBM Project involves loss in available hydraulic head in the target formation (the Wyodak-Anderson coal seam). This head loss could impact water wells completed in the coal seam, in the form of reduced well yields and potential methane production. Surface discharge of extracted groundwater from CBM operations potentially can enhance recharge of shallow aquifers underlying creek areas.

The effects of CBM development on groundwater resources are described in terms of a loss in hydraulic pressure head in the coal aquifer. The effects are seen as a drop in the water level (drawdown) in nearby wells that are completed in the coal aquifer. As groundwater leaves the aquifer and enters the well bore, the water level in a well completed in the coal aquifer rises above the level of the aquifer, and a hydraulic pressure head is generated. Partial removal of groundwater from the coal aquifer (through coal mining operations or CBM development) can reduce the hydraulic pressure head and lower the water level in nearby wells completed in the coal seam. After CBM development (and water removal) ends, water levels in nearby wells are expected to recover somewhat as coal aquifer recharge occurs.

The effects of CBM development, coal mining activities and other existing or reasonably foreseeable development activates are analyzed cumulatively for the Proposed Action, Alternative 1, and the No Action alternative later within this chapter.

Specific groundwater issues associated with the proposed Wyodak CBM development include:

- **Local and regional coal aquifer drawdown resulting from CBM development and surface coal mining.**
- **Maximum areal extent of coal aquifer drawdown.**
- **The magnitude of projected coal aquifer drawdown under various CBM development scenarios.**
- **The extent of coal aquifer utilization and the effect of predicted drawdown on this use.**
- **Wasatch sand aquifer drawdown resulting from CBM development and surface coal mining.**
- **The rate of coal aquifer recharge after CBM operations cease.**
- **The contribution of surface discharge of extracted coal groundwater to the recharge of shallow Wasatch sand aquifers.**
- **The differentiation of coal aquifer drawdown effects resulting from coal mining and CBM development.**

Hydrogeologic Framework

A detailed description of the geology and hydrology of the area is given in Chapter 3. The focus of the impact assessment is the Wyodak-Anderson coal seam (top of the Fort Union Fm) and the overlying Wasatch Fm. The dip of the Fort Union coals in the eastern PRB is generally 1-2 degrees to the west-northwest, although the Wyodak-Anderson coal has numerous "rolls" so that, locally, dips may be quite variable. The Wasatch Fm has several discontinuous sand units that are utilized for water supply. The base of the Wasatch Fm, directly above the Wyodak-Anderson seam, typically is a low permeability claystone that forms a hydraulic confining unit for the coal.

The coal and overburden are eroded where the Wasatch Fm and Wyodak-Anderson coal contact intercepts the land surface to the east. Range fires and spontaneous combustion have ignited the areas of exposed coal at the land surface. The burning of these coal deposits has created a land form composed of permeable material (clinker), formed from the baking and subsequent collapse of the sediments originally above the coal.

Recharge to groundwater aquifers occurs from surface infiltration and from vertical and horizontal migration from adjacent strata. Precipitation provides a minimal source of recharge over most of the area because the climate and surface features prohibit significant infiltration. Infiltration is significant within more permeable surface geologic units such as the clinker occurrences along the eastern outcrop of the Wyodak coal. The clinker areas are generally considered to form significant recharge areas for the coal. Infiltration of surface water in creek valleys is also generally considered to be an important source of recharge to shallow aquifers. The Wyoming Board of Control currently considers surface water losses in river flows due to evapotranspiration and leakage (termed conveyance loss) to be about one percent of the flow per mile. Evapotranspiration probably accounts for most of the conveyance losses, particularly during the summer months. Recharge of shallow aquifers due to leakage from rivers is likely to be approximately 20 percent of the conveyance loss.

Hydraulic connection between the shallow Wasatch sands and the Wyodak-Anderson coal is limited due to the low permeability claystones that separate the two units. However, if the hydraulic head (water level) in the coal is naturally lower than in the overlying sands, then there is potential for leakage from the sands into the coal, or vertical recharge. The natural leakage rate will typically be extremely small, but taken over a large area can amount to a significant portion of the total recharge into the coal. Locally, hydraulic connection between the coal and Wasatch sands may be enhanced should the integrity of the confining layer be compromised by water supply wells screened through both the coal and the overlying sands, by deteriorating well casings, or by poorly plugged oil and gas wells or exploratory drill holes. Leakage from the Wasatch sands into the coal may be enhanced if water levels in the coal are lowered as a result of coal dewatering activities. Due to the limited hydraulic communication between the coal and the overlying Wasatch sands, a significant period of time (typically several years) will likely pass before significant drawdown (drop in water level) effects in the sands are apparent.

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Through time, many clinker deposits have become saturated as a result of the infiltration of precipitation and snowmelt. "Ponding" of water may occur along the interface where the clinker meets the less permeable coal and sediments of the Wasatch Fm. Springs may form at the base of the clinker deposits. The Moyer Spring north of Gillette is a good example of this situation.

Regional groundwater flow is generally to the northwest (downdip) towards potential discharge areas in the north central part of the PRB (USGS, 1986b). Coal wells in the vicinity of the Powder River exhibit flowing artesian conditions that indicate upward flow gradients. This supports the potential for groundwater discharge along the northern part of the Powder River, although physical evidence for this, in the form of springs and sustained river baseflow, are not readily apparent. It is assumed that most of the discharge is diffuse and may be consumed by evapotranspiration so that it does not appear as a surface flow.

Groundwater Modeling Methodology

Numerical groundwater flow modeling was used to predict the impacts of the Wyodak CBM Project. Modeling was necessary because of the large extent, variability, and cumulative stresses imposed by mining and CBM development on the Fort Union and Wasatch aquifer units. Assessment of CBM development impacts has been performed for earlier environmental assessments for the Marquiss, Lighthouse, North Gillette, and South Gillette areas (USDI BLM, 1992a, 1995c, 1996a and 1997a). A detailed modeling study was completed for the Little Thunder drainage basin in the southeastern part of the PRB (WWRC, 1997). The information from earlier studies was reviewed and has been incorporated into the modeling work for the Wyodak CBM EIS, wherever practical.

The main features and assumptions of the model used for the Wyodak CBM EIS are briefly described here. The complete technical description of this groundwater analysis is found in the *Final Technical Report for the Wyodak CBM Project, Groundwater Modeling of Impacts Associated with Mining and Coal Bed Methane Development in the Eastern Powder River Basin (September, 1999)*, on file at the BLM Casper Field Office in Casper, WY and at the BLM Buffalo Field Office in Buffalo, WY. This report describes the specific hydrogeologic data on which the model was based. It also describes the numerical model and model assumptions in more detail.

The hydrogeologic model code selected was the latest version of the USGS Three Dimensional Finite Difference Modular Groundwater Flow Model MODFLOW96. This model code is widely accepted by regulatory agencies and currently is used by the BLM.

The model consists of eight geologic layers. The lowermost two layers (layers 7 and 8) represent the Lower Tongue River/Lebo Members of the Fort Union Fm and the shale confining layer separating the Lower Tongue River/Lebo from the overlying Wyodak coal bed. The Wyodak coal bed is represented by layers 4, 5 and 6 in the model. The Wyodak consists of several coal beds that split and merge in the PRB. The model consolidates these splits into two coal beds (layers 4 and 6), separated by an intervening shale parting (layer 5). The Wyodak coal transitions into more highly permeable clinker at the eastern outcrop area. Data on the coal seams and structure were weakest in the northern portion of the modeled area. Overlying the coal is a layer (layer 3) representing shales within the Wasatch Fm that act as a confining unit between the coal and the discontinuous sandstones within the Wasatch Fm. The second layer represents the Wasatch Fm discontinuous sandstone units. The uppermost layer (layer 1) represents the surface geologic units that include shales, sandstones, and alluvial sands within creek valleys.

Other geologic boundaries that were incorporated into the model include faults and lineaments where these are suspected of having a significant influence on groundwater flow regimes. Faults may act as impermeable (no-flow) boundaries or zones of flow restriction, and lineaments as zones of augmented hydraulic conductivity in the model.

Stresses imposed from surface mining were simulated as drains. Stresses imposed from CBM development were simulated as wells pumping at a constant rate of 12 gpm for an estimated 15-year life. Due to the large number of proposed CBM wells, the uncertain location of the wells, and the large area involved, the model wells actually simulated "pods" of CBM wells, consisting of between eight to twelve wells that are located in relatively small areas.

Model calibration was done to pre-mining, or in a few cases, earliest available static water levels. This was assumed to represent steady state conditions. The model was calibrated in transient state by matching against available historic water level monitoring data.

The mining sequence was simulated, for geographic locations projected to be mined, as incremental impacts in one year stress periods from approximately 1975 (the earliest mining along the Wyodak outcrop with the exception of the Wyodak mine east of Gillette) to the present. Predictive simulations of impacts were modeled to year 2225, about 200 years beyond the presently anticipated end-of-mining, in year 2021. Historic mining records and life of mine plan maps on file with the Office of Surface Mining in Denver, Colorado were used to develop historic mine sequences and to project the approximate future mining sequence. It is recognized that life-of-mine plans are dynamic and may change in future years, but they give a general projection of likely coal removal sequences and mine progression. Annual progress of the mine plans was superimposed on the grid as drains within the model, with the pits left open for two years and then closed.

Current CBM production was simulated in the area using the historic operational data from the existing fields. Future CBM development was simulated using the best estimate of future development rate that is described in Chapter 2. Mining impacts were modeled with, and without CBM development in order to differentiate the impacts of the two imposed stresses.

The groundwater flow model was used to predict the areal extent of aquifer drawdowns due to the superimposed stresses of the proposed CBM development and mining operations on a year-by-year basis. CBM development of the PRB started in 1989. The Rawhide Butte field represented the first commercial CBM production in the PRB. Most of the CBM development to date has been in the Marquiss and Lighthouse areas south of Gillette, and in the vicinity of the Buckskin and Eagle Butte mines north of Gillette. In March 1998, there were approximately 420 operating

CBM wells in the project area (PI/Dwight's, 1998). By November 1998 production data was available for 638 operating CBM wells in the PRB (PI/Dwight's, 1999). Information from the Wyoming Oil and Gas Commission indicates that as of May 1999 there were 902 producing CBM wells in the EIS project area. The model assumed, by the end of 1998, a total of 890 productive CBM wells, 250 wells in the Gillette North assessment area and 640 wells in the Gillette South assessment area. The approximate locations and timing of CBM development through 1998 were input into the model based on actual well records. The location and timing for future CBM development were based on permit applications and engineering judgement considering the distance from existing and proposed pipelines and known favorable areas for CBM development.

For the model, the No Action Alternative assumed 2,890 wells would be operating in the project area (2,000 new wells plus the 890 wells existing at the end of 1998). For this alternative, the new wells are assumed to be completed over the next five years (1999 to 2003). The Proposed Action has 3,890 wells operating in the project area (3,000 new wells and 890 wells existing at the end of 1998). For this alternative, the new wells are assumed to be completed over the next seven years (1999 to 2005). The Alternative 1 development scenario has 5,890 wells operating in the expanded project area (5,000 new wells and 890 wells existing at the end of 1998). For this alternative, the new wells are assumed to be completed over the next five years (1999 to 2003).

The following discussion outlines the projected impacts to groundwater quantity and quality under the Proposed Action, Alternative 1, and the No Action Alternative. The differences in projected impacts under the three alternatives are only significant with respect to the extent of drawdown in the coal and Wasatch aquifers. There is very little difference in the impacts to water quality under the three alternatives.

Proposed Action

Water Quantity

Prediction of Local and Regional Coal Aquifer Drawdown Resulting from the Development

Figure 4-1 shows the interpreted pre-mining groundwater elevations (potentiometric surface) in the Wyodak coal. This map is based on water level measurements in coal wells taken on dates prior to, or closely following, the start of mining in any given area. Some water level measurements taken at a later date are used to generate the pre-mining map if the well is located at a sufficient distance from mining so that it was unlikely to be affected. Sources of the data used to generate the pre-mining map include Daddow (USGS, 1986b), the Gillette Area Groundwater Monitoring Organization (GAGMO) database for 1980 water levels, individual mine data, and the BLM.

Figure 4-2 shows the interpreted cumulative water level changes measured in the coal aquifer between the years 1980 and 1995 based on data collected by GAGMO. This map has consolidated the drawdowns for the Anderson and Canyon coal seams in the southern part of the area. Most of the mining in the PRB was initiated after 1977 (with the exception of the Wyodak and Belle Ayr mines) so that the use of 1980 as the baseline year (i.e. pre-mining) is reasonable.

For comparison, the model predicted drawdowns for year 1995 are shown superimposed on the GAGMO interpreted drawdowns in Figures 4-2A, 4-2B and 4-2C. It can be seen that the model predicted drawdowns for the year 1995 generally compare favorably with actual measured drawdowns. The model predicted extent of drawdown, represented by the 5-foot drawdown contour, tends to be more extensive than the GAGMO interpretation in the northern and southern portions of the Wyodak study area (Figures 4-2A and 4-2C). This may be partly attributable to the fact that the model drawdown assumes 1975 as the base year, while the GAGMO drawdown assumes 1980 as the base year. The model also accounts for drawdown in the coal that occurs due to pumping of the underlying Fort Union sands by the city of Gillette and the town of Wright that started prior to 1980. This has the effect of imposing a small amount of coal drawdown (5 to 10 feet) over an extended area above these well fields. The drawdown in the vicinity of the mines compares fairly closely, as represented by the similarity of the modeled and actual 20-foot drawdown contour.

In the area immediately west of the Belle Ayr Mine, the extent of drawdown predicted by the model, represented by the five-foot drawdown contour, is very similar to that actually observed, as shown Figure 4-2B. The model under-predicts the amount of drawdown in the center of the Marquiss field drawdown cone created by the superimposed influences of mining and CBM. The under-prediction of drawdown in this area is primarily during the early mining period. From 1980 to 1992, prior to significant CBM development, drawdown west of the Belle Ayr mine was between 60 and 100 feet. After CBM development in the Marquiss field, drawdowns in this area increased significantly to over 250 feet. The model matches the increase in drawdown due to CBM development fairly closely, but under predicts the early mining drawdown, resulting in an overall under-prediction of drawdown in this area for 1995. This is described later in the section.

Prediction of Coal Aquifer Drawdown Rate

The model predicted drawdowns in the year 1995 for the Wyodak study area are shown in Figures 4-3 and 4-4 for the Upper Wyodak and Lower Wyodak coals, respectively. It can be seen that, on a regional scale, the model predicted drawdowns for the year 1995 compare favorably with actual measured drawdowns shown in Figure 4-2. The extent of coal drawdown, represented by the five-foot drawdown contour, tends to be more extensive than the GAGMO interpretation in the north and south of the Wyodak study area, for the reasons given earlier.

The model predicted maximum drawdown in the coal aquifer for the Proposed Action CBM development is in the year 2008, and is shown in Figures 4-5 and 4-6 for the Upper Wyodak and Lower Wyodak coals, respectively. Because the mining and CBM operations are dynamic, the maximum areal extent of drawdown changes over time and may increase in some areas of the PRB while recovering in others. The CBM water production in the project area under the Proposed Action is expected to peak in years 2005 to 2007, resulting in maximum drawdown in about the year 2008.

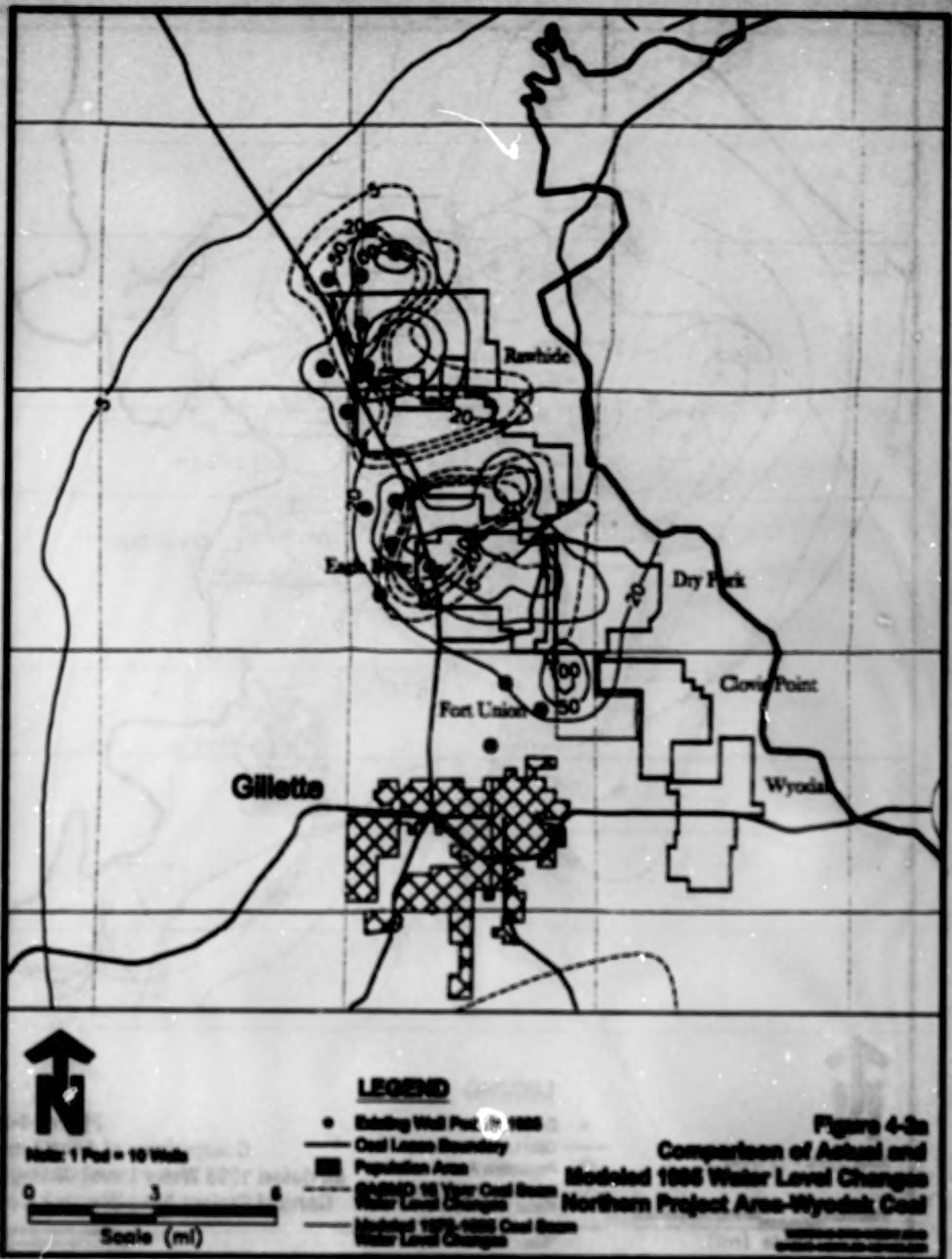

Figure 4-2a
Comparison of Actual and Modeled 1995 Water Level Changes
Northern Project Area-Wyodak Coal

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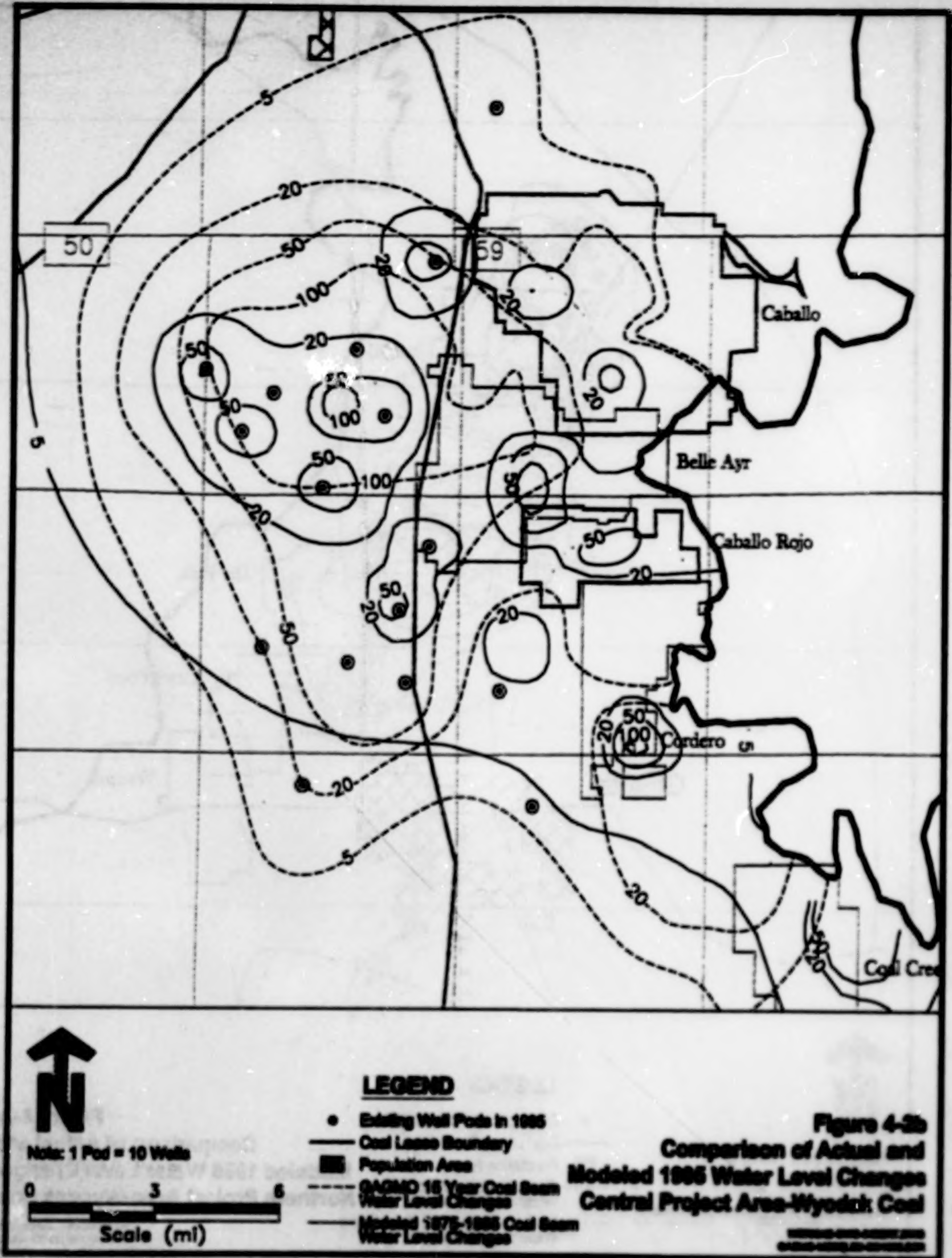

Figure 4-2b
Comparison of Actual and Modeled 1995 Water Level Changes Central Project Area-Wyodak Coal

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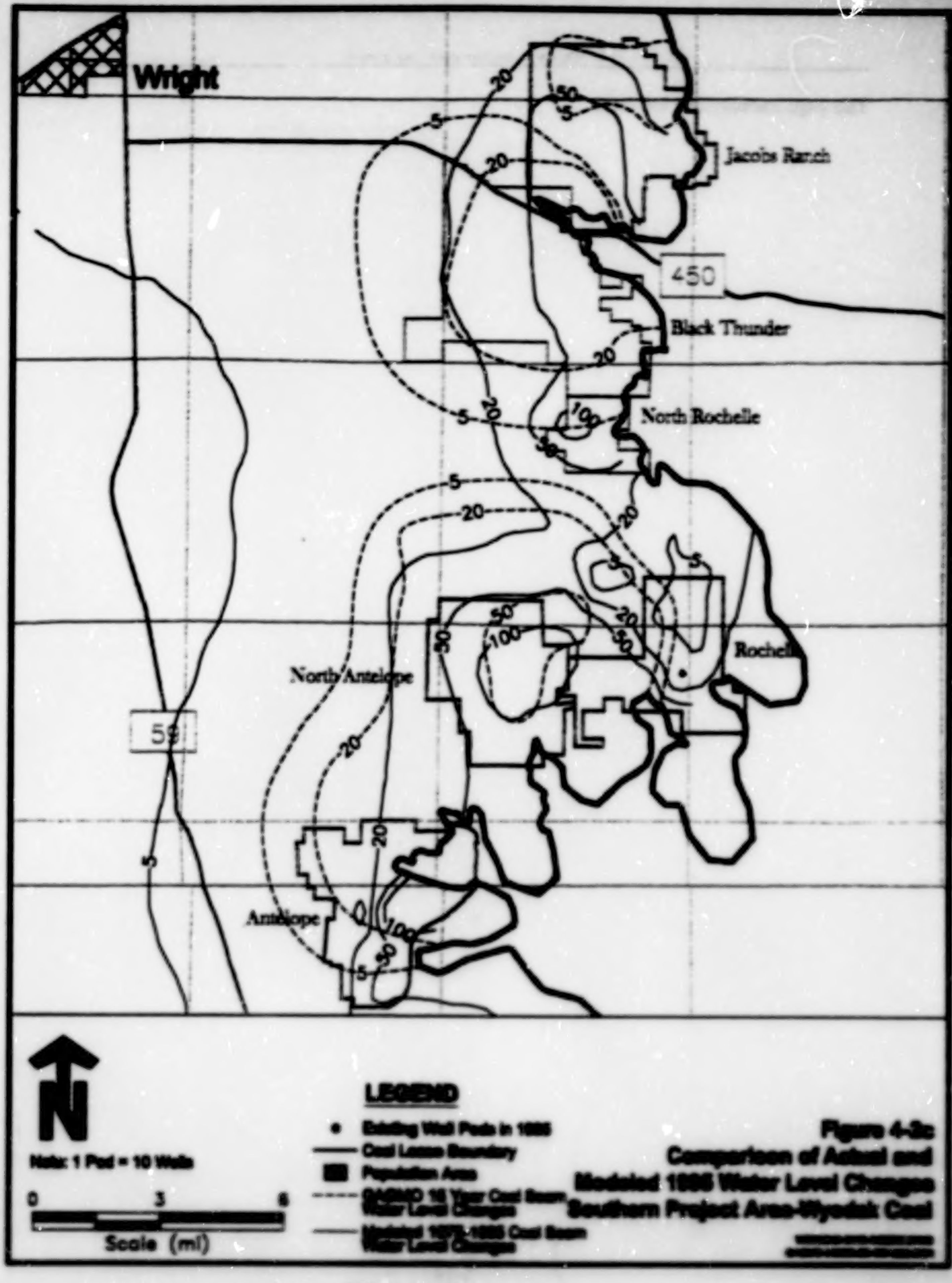

Figure 4-2c
Comparison of Actual and
Modeled 1995 Water Level Changes
Southern Project Area-Wyodak Coal

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The maximum extent of drawdown, defined as a drawdown of at least five feet, extends 15 to 24 miles from the point of maximum drawdown within areas of potential dense CBM development such as in the central part of the project area. Predictions of maximum drawdown and extent of drawdown are based on the projected well pod locations. Actual drilling locations and density of drilling may result in shifts of drawdown contours from the results illustrated in the figures.

Maximum drawdowns occur in the vicinity of active mining operations and in the centers of CBM development. Because of the way the numerical model is subdivided into discrete cells, drawdowns due to CBM well pumping are averaged over the area of a cell (typically ten acres). Consequently, the drawdown at a pumping well is not accurately simulated, and would actually be more than represented by the model. The model simulations are representative for areas located greater than 200 to 300 feet from a pumping well. Within the northern portion of the project area, CBM production is primarily from the Upper Wyodak. In this area, model projected drawdowns are generally over 200 feet within the center of the well field and over 300 feet in localized areas. In the southern portion of the project area, the maximum drawdowns are projected to be greater than 100 feet over most of the active well fields, over 200 feet in the center of the well fields and over 300 feet in localized areas. Depths of drawdown are approximately 50 feet more in the Lower Wyodak coal than in the Upper Wyodak coal within active fields.

Hydraulic head in the coal, as measured by the water level in a well completed in the coal, may be several hundred feet above the top of the coal. This is particularly true in the western part of the project area where the depth to the coal may be over 1200 feet while the depth to water in a well tapping the coal may be only 400 feet, resulting in a hydraulic head of 800 feet. Dewatering of the coal in these areas by CBM development can result in drawdown of the hydraulic head to the top of the coal (up to 800 feet) at the location of the pumping wells, even though the thickness of the coal itself may only be 100 feet.

Recovery of water levels in the coal is apparent after CBM production starts to decline. Production is expected to start declining around 2012 and end by around the year 2021. Recharge to the coal comes primarily from the redistribution of stored water in the surrounding coal and continued slow leakage from overlying Wasatch sand aquifers. By 2050, water levels in the coal are projected to recover to within 20 to 50 feet of pre-mining levels. The maximum extent of the 5-foot drawdown to projected to extend 2 to 5 miles from the edges of former CBM development.

The rate of coal aquifer drawdown is presented by graphs of modeled drawdown versus time at selected locations in the model. These graphs also illustrate the recovery of water levels following the cessation of CBM operations and mining operations. The locations of the monitoring points are shown on **Figure 4-7**. A comparison of model projected drawdown in the area of maximum CBM development, for the three development scenarios considered, is shown in **Figure 4-8**. Water levels under the Proposed Action recover more slowly than under Alternative 1 because the drilling of wells under the Proposed Action was modeled to occur over 7.5 years while Alternative 1 was modeled to occur over 5 years. Water level drawdown graphs for selected monitoring wells in the northern and southern portions of the project area are shown in **Figure 4-9**. The graphs show that the water level changes in the coal aquifer induced by CBM operations tend to be fairly rapid. Initial recovery of coal water levels following cessation of CBM operations also is rapid, with levels recovering to within less than 40 feet of pre-mining levels within a few years following cessation of CBM operations. However, the rate of recovery slows dramatically after the first few years, and complete recovery to pre-operation conditions may take hundreds of years.

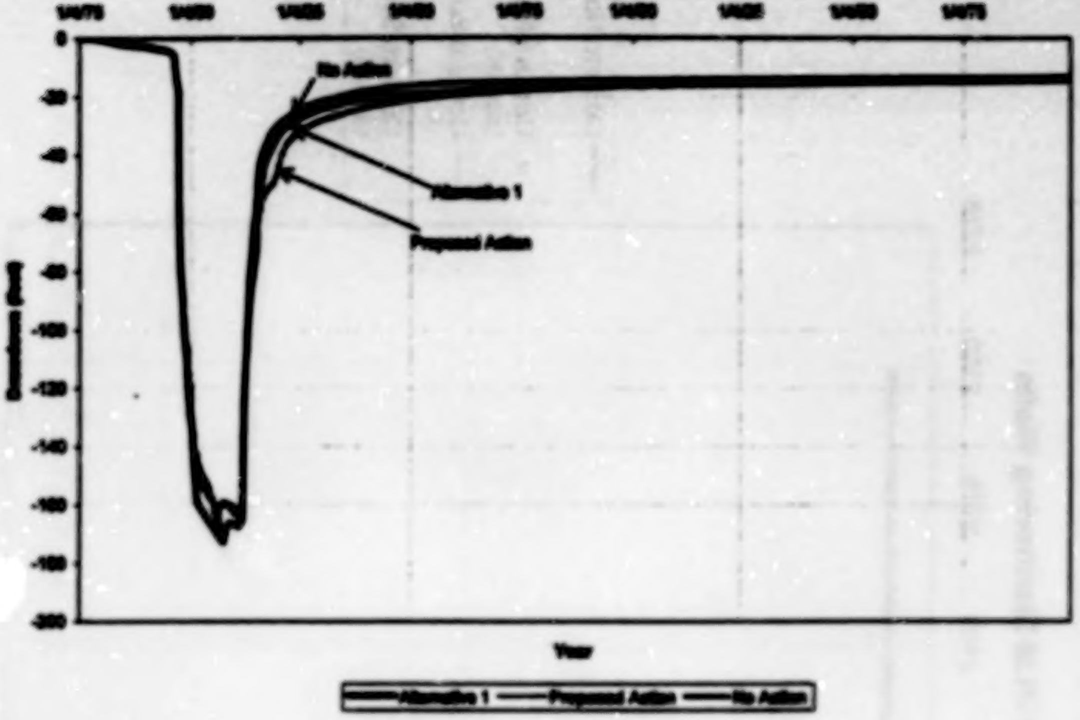
Extent of Aquifer Utilization and the Effect of Predicted Drawdown on this Use

The extent of aquifer utilization has been largely documented in previous assessments. This work was updated and supplemented by examination of WSEO records (Table 3-8). Impacts to individual water wells completed within the coal, and in sands above the coal, would depend on proximity to dewatering wells, depth and completion interval of the water well, and the water well yield required to maintain it as a usable source. Drawdown of water levels in coal aquifers caused by CBM development potentially may impact individual well users by reducing well yield. Withdrawal of water from the coal aquifer during CBM development can depressurize the aquifer and induce methane release into nearby water wells. Water level changes are not expected to be as significant in the aquifers above or below the coal because the coal is partially confined both above and below by low permeability claystone layers. Drawdown of water levels in the overlying Wasatch sand aquifers also can impact individual well yields but is not likely to induce methane production in these wells. The model indicates that the sand units within the lower Tongue River and Lebo members of the Fort Union Fm may experience water level declines of up to 50 feet in areas of intensive CBM production in the overlying Wyodak coal. This is unlikely to significantly impact the utilization of these aquifer units for water supply. For individually impacted water wells, see the "Hydrologic Monitoring and Mitigation" section of Chapter 2. A standard agreement has been developed by CBM operators and landowners to monitor and mitigate impacts to individual well owners that are caused by CBM operations. A copy of this agreement format is contained in Appendix D of the DEIS.

Wells fully penetrating the coal with pumps set low within the coal are likely to be less impacted than those only partially penetrating the coal and with relatively shallow set pumps. Water still will be available from the coal at a deeper depth and from shallower or deeper aquifers.

Under the Proposed Action, the model predicts over 300 feet of coal aquifer drawdown near the centers of active CBM development, with drawdown in excess of five feet extending some 15 to 24 miles from these areas (Figures 4-5 and 4-6). The maximum available drawdown (the hydraulic pressure head) in the coal aquifer in the affected areas ranges from 300 to 1,000 feet. Most individual water supply wells in the coal seam do not exceed 600 feet and have up to 300 feet of available drawdown. Well pumps typically are set between 50 to 200 feet below the static water level in the well. Significant impact in terms of well yield or availability is likely to be an issue only if the drawdown exceeds about 20 to 30 percent of available drawdown at any given location. This area would tend to coincide with the area of drawdown in excess of about 100 feet. The decreased head against which the well pump has to operate may cause the pump discharge to decrease.

Figure 4-6
Comparison of Alternatives for Maximum Drawdown Over Time



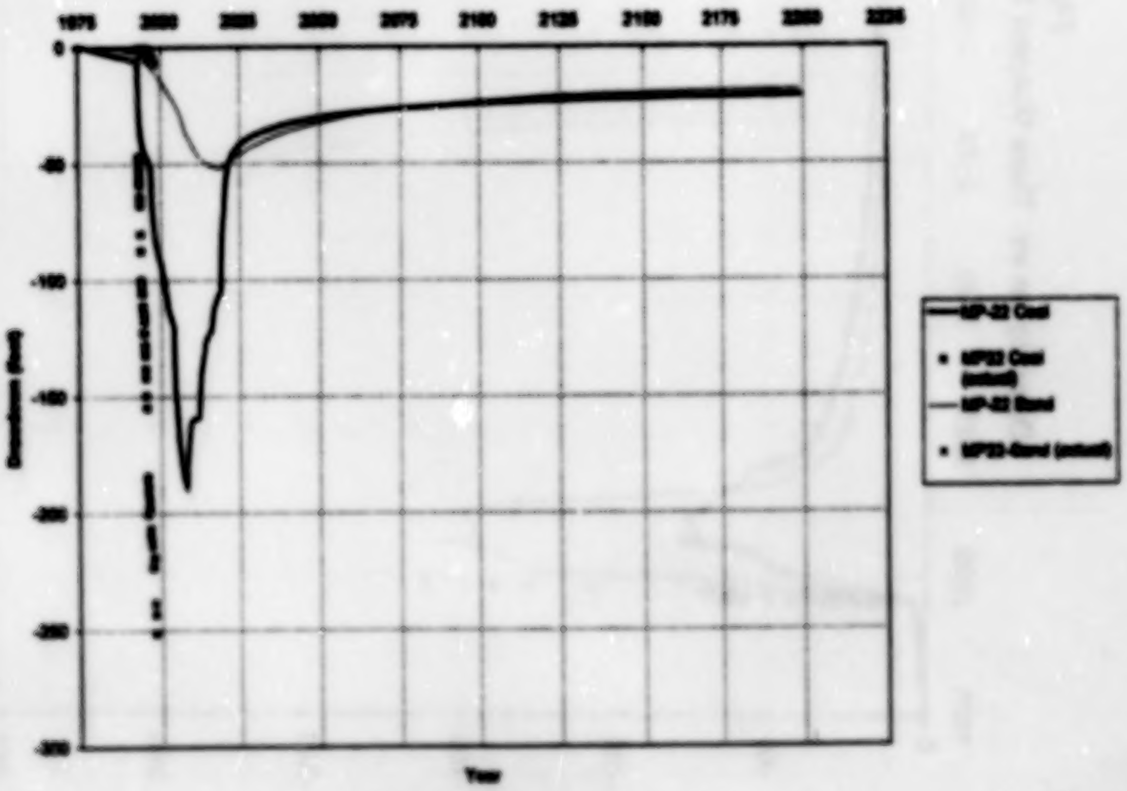


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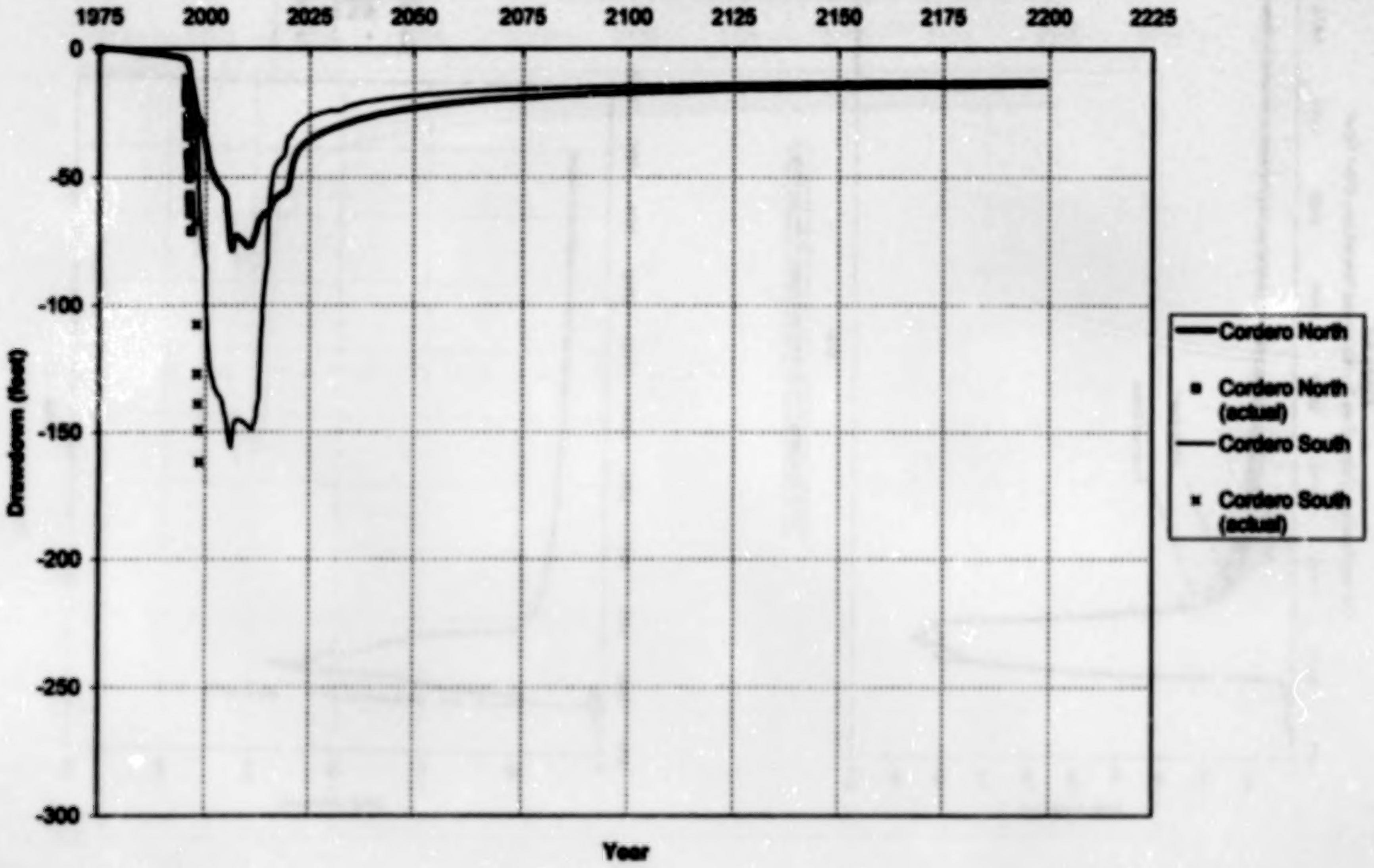
Figure 4-9
Drawdown vs. Time Graphs for Selected BLM Monitoring Wells



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However, if sufficient available drawdown remains in the well, yield may be restored by installing a larger pump. In cases where the drawdown causes the water level in a well to drop below the intake of the pump, the pump may have to be lowered in the well.

Individual coal aquifer well users may experience increased methane emissions if their wells fall within an area of significant aquifer depressurization. Records of first indications of methane production in monitoring wells that have experienced water level drops due to mining indicate that methane emission from the coal can occur with as little as 50 feet of head drop (Stowe, 1998). Consequently, coal wells within the predicted 50- foot drawdown area may be susceptible to this impact. Methane emissions by a well pose a potential explosive safety hazard, particularly if gases can build up in an enclosed space. In areas within two miles of operational CBM well fields, well houses and basements should be well ventilated and periodically checked for methane gas.

Over most of the eastern PRB, the Wyodak-Anderson coal is separated from sands in the overlying Wasatch Fm by continuous, low-permeability clay and silt units of variable thickness. Examination of drilling and geophysical logs from coal mine permits and from twelve state-owned sections south of Gillette and west of the coal mine permit areas shows that the thickness of this confining unit ranges from 11 to 363 feet. In most cases, the clay confining unit was at least 30 feet thick. The large variation in thickness is mostly a function of whether any significant sands exist in the lower part of the Wasatch Fm at a given location. This clay unit has the effect of partially isolating the coal from the overlying Wasatch sands. This low permeability zone allows limited hydraulic communication between the coal and the overlying Wasatch sands. A significant period of time (typically several years) will likely pass before drawdown effects in the overlying Wasatch sands are apparent as a result of pumping groundwater from the coal. In addition, as noted in Chapter 3, the integrity of the confining layer may be compromised locally by water supply wells screened through both the coal and the overlying sands, by deteriorating well casings, or by poorly plugged oil and gas wells or exploratory drill holes.

Partial isolation of aquifers overlying the coal has been supported by the results of the BLM water monitoring efforts at the Marquiss CBM project, which has had the longest history of operation (since 1993). In this instance, the BLM has operated two paired wells (a well completed in the coal and a well completed in the next overlying sand zone) since the beginning of the project (see Well MP-22 in Figure 4-9). Communication has been seen between the deeper (coal) wells and the shallow (sand) wells. Water level decline in the coal well is up to 200 feet during the five years of monitoring while the water level decline in the overlying aquifer has been documented, but at a relatively mild rate (ten to twenty feet over five years in one well).

CBM production relies on the integrity of the confining layer above the coal. Without the confining layer, the gas would be free to escape to the atmosphere and water leaking downward from shallower layers would make it more difficult or impossible to lower the pressure in the coal seam by pumping water from it.

Drawdown impacts in the overlying Wasatch sand aquifers are predicted to be much less than in the coal aquifer, but may be significant. Model predictions in the Wasatch sands are less reliable than in the coal because of the discontinuous nature of the sands. Predictions are for a sand unit ranging from 200 to 500 feet above the coal. Figure 4-9 shows the drawdown vs. time predicted in the Wasatch sands for some selected monitoring well locations. Figures 4-10, 4-11 and 4-12 show the maximum predicted drawdowns in the Wasatch sands under the Proposed Action, Alternative 1, and No Action CBM development scenarios respectively. The maps show that maximum drawdowns in the Wasatch sands occur in the vicinity of active mining operations and in the centers of CBM development.

The predicted maximum drawdown in the Wasatch Fm associated with CBM development under the Proposed Action occurs in the year 2015, several years after the maximum drawdown predicted in the coal in 2008 (Figure 4-10). Drawdown in the Wasatch sands tends to increase slowly as leakage is induced by partial dewatering of the underlying coal. The maximum drawdown is about 60 feet in the northern area at this time. The maximum extent of drawdown in the Wasatch is projected to be as much as 16 miles from the edge of the main centers of CBM development in the central area. The drawdown continues after CBM operations cease, and coal water levels start to recover, because the Wasatch Fm is a source of recharge to the coal. Recovery in the Wasatch tends to occur once coal water levels have recovered significantly and induced leakage from the Wasatch is minimal. The model predicts that water levels in the areas of highest drawdown will recover to within about 20 feet of pre-operational conditions (Figure 4-9). There are likely to be local areas in the Wasatch sands which see greater drawdown than predicted by the model due to conducive faults, poorly grouted well bores, and exploration borings. This amount of drawdown may cause impacts to users of Wasatch aquifer water. The water well agreement would provide sufficient protection to landowners if impacts occur.

The predicted maximum drawdown in the Wasatch Fm associated with CBM development under Alternative 1 also occurs in the year 2015, several years after the maximum drawdown predicted in the coal for this alternative in 2010 (Figure 4-11). The maximum drawdown is about 80 feet. The maximum extent of drawdown in the Wasatch is projected to be slightly more than in the Proposed Action at about five miles from the edge of the main centers of CBM development.

The predicted maximum drawdown in the Wasatch Fm associated with CBM development under the No Action alternative also occurs in the year 2015, several years after the maximum drawdown predicted in the coal for this alternative in 2008 (Figure 4-12). The maximum extent of drawdown in the Wasatch is projected to be slightly less than in the Proposed Action at about three miles from the edge of the main centers of CBM development.

Projected Impacts to Springs

Springs issuing from the Wasatch sands into surface drainages are unlikely to be affected by CBM development. This is due to the projected limited effect of CBM development on Wasatch Fm water levels described in the previous section.

The public expressed concern regarding the potential impact of CBM development on springs issuing from the clinker outcrops, such as the Moyer Springs north of Gillette. Moyer Springs is located in Sec. 30 T51N R71W, outside the proposed project area but its recharge area is close to the CBM development area.

Moyer Springs is located at the base of an exposed clinker deposit that is in the outcrop area of the target coal seam (known as the Roland-Smith in this area of the PRB). Recharge of the springs is through surface infiltration and lateral movement of water from adjacent clinker and alluvium. Large areas of clinker are exposed northeast and southeast of Moyer Springs (USGS, 1978).

This exposure allows a large amount of recharge to the clinker by infiltration of rainfall and snowmelt. USGS (1973) reported a flow of 200 gallons per minute from Moyer Springs. The contact between the clinker and the associated coal seam in this area appears to have a low permeability. Although the natural discharge of springs potentially can be impacted by a reduction in the hydraulic head in the source aquifer unit, the presence of a low permeability zone between the clinker and the target coal results in water in the clinker being channeled to the spring rather than recharging the coal. The presence of the low permeability zone between the clinker and the target coal inhibits flow between these units. This fact and the high flow rate observed at Moyer Springs imply that production of Wyodak groundwater during CBM operations should not adversely affect the hydrology of Moyer Springs. The potential impact to Moyer Springs flows by proposed surface mining has been recognized, as removal of the Wasatch Fm and alluvial overburden during mining operations may decrease recharge to the spring. Accordingly, the Dry Fork Mine Permit requires Dry Fork Coal Company to protect the clinker aquifer that feeds Moyer Springs.

CBM operations are not expected to have any impact on Moyer Spring water quality because discharge water is not likely to encroach on the recharge area of the spring. Water from Moyer Springs is of calcium sulfate chemical type, with total dissolved solids concentrations in the 1,000 mg/l to 2,000 mg/l range (USGS, 1973). CBM production water from the Wyodak coal will be of equal or better quality. Therefore, even if some CBM discharge water did recharge the Moyer Springs, CBM operations should not adversely affect its water quality.

The description of potential impacts to Moyer Springs is applicable to other springs issuing from clinker outcrops. Therefore, no impacts to these springs are projected.

Rate of Coal Aquifer Recharge after CBM Operations Cease

Recovery of groundwater levels in the coal aquifer after CBM operations cease is best illustrated in the comparative drawdown graph for the various CBM development scenarios in Figure 4-8 and in the graphs of selected monitoring locations in Figure 4-9. Initially recovery is primarily due to redistribution of groundwater stored in the aquifer. When the stresses of pumping are removed, the groundwater in storage to the west, north and south of the CBM development area will resaturate and repressurize the areas that were partially depressurized during operations. The amount of groundwater storage within the coal to the west of the development is enormous, and redistribution is predicted to result in a fairly rapid initial recovery of water levels in the coal. The model predicts that this initial rapid recovery period will occur over three to four years, but water levels only will recover to within 20 to 30 feet of pre-operational conditions.

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Complete water level recovery will be a very long-term process because actual recharge to the coal aquifer needs to replace groundwater removed from storage during CBM operations. Actual recharge to the coal through surface infiltration at the eastern outcrop area is a relatively slow process. Coal mining along the eastern outcrop results in minimal recharge to the coal while mines are active, due to the groundwater sink caused by pit dewatering. As mines are reclaimed and eventually shut down, the backfilled areas would become long-term recharge zones for the coal aquifer. Infiltration through backfill areas may be very significant because the permeability of the backfill materials tends to be much higher than in the original unmined materials. In addition, most of the creeks would be diverted over these backfilled areas, providing a significant source of recharge water.

Contribution of Extracted Coal Groundwater to the Recharge of Shallow Wasatch Sand Aquifers

Extracted groundwater from CBM operations currently is released to surface waters. A portion of the released water recharges the alluvium along the creek valleys that in turn recharges the underlying Wasatch units. AMAX Coal West's Belle Ayr Mine monitoring data noted slight "mounding" of groundwater levels within the Wasatch sand in the vicinity of Caballo Creek, indicating that this recharge is occurring. Monitoring of alluvial water levels in Hoe Creek has also indicated water level rises due to increased creek recharge. The extent of recharge has not been quantified and is primarily a function of the permeability of the surficial Wasatch geologic units underlying the creeks in any given area.

Alluvium with near-surface water tables, similar to the Donkey Creek alluvium in Gillette, will likely see increases in water levels from CBM produced water discharge. The increase in water level may be exhibited as standing water in areas not previously displaying this condition or as wetland development. The City of Gillette is pumping the alluvium within the community (Appendix E, Letter No. 23 and Carson 1999). The city's rate of pumping will likely have to increase to maintain current water levels during continued CBM field development.

The recharge effect was evaluated in this analysis by examining the area of affected alluvial drainages and the probable range of vertical infiltration rates into the Wasatch Fm below the creeks. The total discharge from CBM operations was calculated for each of the major surface drainages under the three alternatives (Tables 2-1 and 2-2). This discharge was assumed to flow toward the major creeks within each drainage. Surface water losses in river flows due to conveyance losses (evapotranspiration and leakage) were assumed to be one percent of the flow per mile (WSEO, 1998a). Recharge of shallow aquifers due to leakage from rivers was assumed to be 20 percent of the conveyance loss (Babb, 1998). The area of alluvium was estimated for all major creeks downgradient from proposed CBM operations and the river leakage then expressed as an equivalent recharge. An upper recharge limit of five inches per year was assumed, based on the expected ability of the underlying Wasatch to accept this recharge. This recharge along the major drainages was then input into the model for the time period when CBM operations are expected to be active.

The Wasatch sand maximum drawdown for the year 2015 (Figures 4-10, 4-11, and 4-27) shows much less drawdown than the Fort Union coals. This is primarily due to the sand isolation from the pumped coals, but also because the Wasatch sands are recharged by water infiltrating into the alluvium. There is significantly less drawdown of the Wasatch sands in the vicinity of major creeks as a result of the recharge. In some areas, a build-up of water levels is predicted due to recharge derived from CBM produced waters discharged into streams.

Effect of Variable Pumping Rates on Predicted Impacts

The projected pumping rates for the proposed CBM development scenarios are estimated based on experience from current operations. As stated earlier, the model used a uniform well extraction rate of 12 gallons per minute for the entire duration of an assumed 15-year life for each well. This rate is considered to be conservative in terms of drawdown prediction because the more extensive dewatering effect of the denser well spacing in the proposed development may result in lesser pumping rates for individual wells or a more rapid decline in these rates.

Water Quality

Groundwater produced from the Wyodak coal during CBM operations will be discharged to local drainages. This water has the potential to recharge shallow aquifers, primarily local alluvial aquifers and Wasatch Fm sands, as discussed in the section of water quantity impacts. Drilling is not expected to modify water quality in the formations drilled in the development of the CBM well. Thus, there should be no impact to the quality of aquifers in the Wasatch sands or the Wyodak coal. Similarly, groundwater quality in the major bedrock aquifers below the Wyodak coal will not be affected by CBM operations. Alluvial water quality may become less saline with active constant recharge from surface waters.

Recharge by coal aquifer water will result in localized mixing with the waters of the alluvial and Wasatch aquifers. Comparison of total dissolved solids (TDS) and specific chemical constituent concentrations in the Wyodak coal groundwater with Wasatch and alluvial aquifer groundwater will show the impact this mixing will have on water quality in these upper aquifers.

Potential Water Quality Impacts Due to Recharge of Coal Aquifer Water

As discussed in Chapter 3, groundwater quality in the Wyodak coal (average TDS = 764 mg/l, WDEQ, 1998a) is typically equal to or better in quality than that in the Wasatch Fm (average TDS = 1,415 mg/l) and alluvial aquifers (average TDS = 2,232 mg/l). Chemical groundwater type in the Wyodak coal is predominantly sodium bicarbonate as compared with the Wasatch Fm and alluvium (calcium and sodium sulfate). Coal aquifer water typically does not have elevated concentrations of selenium. Therefore, discharge of Wyodak production water from the CBM program to local alluvial and Wasatch aquifers is not projected to adversely affect groundwater quality in these aquifers. There may be a slight shift from a calcium/sodium sulfate dominated water chemistry towards a more sodium bicarbonate type. However, this shift is only likely to be noticeable in localized areas of alluvial recharge. The water chemistry shift is not anticipated to be very significant or detrimental. Sodium bicarbonate water generally is considered to be better than calcium/sodium sulfate water for domestic and stock uses. Sulfate has a secondary drinking water quality standard of 250 mg/l while bicarbonate has no water quality standard.

Potential Impacts to Groundwater Quality Due to Drilling Operations

During drilling of CBM production wells, various chemical additives are added to the drilling fluids to enhance drill cutting removal and hole stability. Typically, the Wasatch Fm is drilled using mud rotary drilling techniques. Drilling mud is usually native mud and bentonite. As hole conditions dictate, small amounts of polymer additives and/or potassium chloride salts may be added for hole cleaning and clay stabilization. The potassium chloride and the chemicals within the polymers do not pose toxicity problems if used in accordance with manufacturers' specifications. Well casing extending to the top of the target coal seam is cemented into place. The coal is then drilled out using air rotary drilling techniques. A drilling foam is usually added to the air to enhance cuttings removal. The chemicals within the foam are also non-toxic, when used in accordance with manufacturers' specifications.

Most of the drilling fluids are removed from the borehole during well completion and are collected in surface drilling pits during both the mud-rotary and air-rotary drilling operations. After drilling is complete, the drilling pits are allowed to dry out and then are backfilled and revegetated. Post drilling fracturing of the coal seam for permeability enhancement involves the injection of clean water only. This water is removed during subsequent water production from the well. Based on the use of non-toxic chemicals during well-drilling operations and the removal of most drilling fluids, there is an extremely low potential for degradation of groundwater in either the coal or Wasatch sand aquifers due to CBM exploration and development.

Alternative 1

Drawdowns in the coal aquifer are more extensive for Alternative 1, compared with the Proposed Action. This is illustrated in Figures 4-13 and 4-14 for year 2010 as the time of greatest drawdown impact in the expanded project area. The more extensive drawdown area results from more widespread CBM development and the extraction of groundwater from a larger number of wells. As noted previously, modeled results reflect educated projections of the locations and densities of well pods within the expanded project area. Actual drilling sites may modify the locations of maximum drawdown and the extent of drawdown. A comparison of the extent and depth of drawdown for the three alternatives is summarized on Table 4-1.

The maximum extent of drawdown in both the Upper and Lower Wyodak coals, defined as a drawdown of at least five feet, extends about 27 to 30 miles from the maximum point of CBM drawdown. In areas of potentially less dense development, such as west of Highway 50 and south of the town of Wright, the extent of drawdown is about 30 miles from the maximum point of drawdown in the CBM development areas. Maximum drawdowns in the areas of most extensive development under Alternative 1 are similar to or slightly more than drawdowns under the Proposed Action. The maximum predicted drawdown in the northern portion of the expanded project area and in the area south of Gillette is over 200 feet. The maximum drawdown is over 180 feet in the southern portion of the expanded project area for the Upper Wyodak coal seam.

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Table 4-1
Comparison of Extent and Depth of Maximum Drawdown by Alternatives

	Proposed Action 2008	Alternative 1 2010	No Action 2008
Upper Coal **Maximum 5' Drawdown Extension (miles)**			
North	19	27	18
Central	24	34	20
South	21	30	22
Maximum Drawdown (feet)			
North	>200	>200	>200
Central	>200	>200	>200
South	>100	>100	>100
Lower Coal **5' Drawdown Extension (miles)**			
North	20	30	20
Central	22	30	25
South	15	30	14
Maximum Drawdown (feet)			
North	>300	>250	>250
Central	>250	>200	>200
South	>100	>100	>100
	Proposed Action 2015	**Alternative 1 2015**	**No Action 2015**
Wasatch **5' Drawdown Extension (miles)**			
North	15	17	15
Central	16	18	17
South	18	30	16
Maximum Drawdown (feet)			
North	>60	>80	>80
Central	>50	>40	>40
South	>50	>60	>50

Maximum Wasatch Fm drawdowns are up to 80 feet and occur in the year 2015 (Figure 4-11. Maximum drawdowns border the eastern boundary of the expanded project area near the coal outcrop. The areal extent of drawdown to the 5-foot contour level is about 17 to 30 miles from the maximum point of drawdown in the areas of most intense CBM development.

No Action

Compared with the Proposed Action, drawdowns in the coal aquifer are less extensive under the No Action Alternative. This is illustrated in Figures 4-15 and 4-16 for year 2008 as the time of greatest drawdown impact in the project area. The less extensive drawdown results from lower and less dense CBM development. The maximum extent of drawdown extends about 14 to 25 miles from the maximum point of drawdown in the areas of most intense CBM development. Maximum drawdowns in the areas of most extensive development are similar or slightly less than expected drawdowns for the Proposed Action. The maximum predicted drawdown in the Upper Wyodak coal for the northern portion of the project area is over 200 feet, for the central portion of the project area south of Gillette is over 200 feet, and for the southern portion of the project area is over 100 feet. The extent of drawdown and maximum drawdown is slightly greater for the Lower Wyodak coal (Table 4-1).

The maximum drawdown projected for the Wasatch Fm will occur along the eastern boundary of the project area and will range from 40 to 80 feet (Figure 4-12). The maximum extent of drawdown in the Wasatch is projected to be slightly less than in the Proposed Action and ranges from 15 to 17 miles from the main centers of CBM development.

GROUNDWATER CUMULATIVE IMPACTS

The cumulative impact of surface coal mining and CBM development on groundwater emerged as an area of concern during the scoping process and in comments received on coal leasing proposals and the CBM projects. The Land Quality Division (LQD) of the WDEQ is required by the Surface Mining Control and Reclamation Act (SMCRA) and LQD rules and regulations (WDEQ, 1998d) to assess the potential for cumulative hydrologic impacts of current and anticipated mining on the ground and surface water systems each time a mine permit application or a mine permit revision is made.

In 1987, the USGS, in cooperation with the LQD and the Office of Surface Mining, Reclamation and Enforcement (OSM), conducted a study of the hydrology of the eastern PRB. The purpose of the study was to provide the hydrologic information needed to perform these assessments. The resulting document, "Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming," (CHIA) describes the cumulative effects of all current and anticipated mining (as of 1987) on the hydrologic system (USGS, 1988). At the time, the 1988 CHIA was the most comprehensive basin-wide assessment of the potential hydrologic impacts of surface coal mining in the Wyoming PRB. However, the CHIA did not address the impacts of CBM development, as this was not anticipated at the time.

As a result of a cooperative agreement signed in 1995, BLM, OSM, the University of Wyoming, and the WSEO provided assistance to LQD in updating the CHIA process. A pilot CHIA study was performed in the Little Thunder Drainage Basin (WWRC, 1997).

The common, and potentially cumulative impacts to groundwater resources by activities associated with CBM development and those impacts associated with coal mining include withdrawal of water from the coal seam resulting in a loss of head in the coal, and the surface discharge of this produced water. The groundwater model used to assess existing and reasonably foreseeable groundwater conditions included the impacts of both mining and proposed CBM development. The impact assessment was presented in Chapter 4.

Differentiation of impacts between CBM development activities and coal development activities is presented below. There are some similarities and also significant differences in the impacts associated with mining and CBM development. These include:

Impacts to the Coal Aquifer: Both mining and CBM development result in partial removal of water from the coal seam. In mining, the coal is removed so that impacts to the coal aquifer in the areas of mining are significant. Immediately adjacent to active mine pit areas, the coal will drain into the pit and become dewatered. The extent of coal aquifer dewatering and depressurization associated with mining is largely dependent on the continuity of the coal in the vicinity of the mine and its overall permeability (a function of fracturing). In areas of high coal permeability, which tend to coincide with major fracture trends, the extent of drawdown may be several miles. Areas of limited coal drawdown related to mining are associated with lower permeability or less fracturing in the coal.

During active CBM development, pumping groundwater from the coal induces depressurization. Pumping removes water (and methane) from the coal but leaves the coal itself essentially undisturbed. Depressurization within the coal caused by CBM development will be more widespread than that due to mining because CBM development will cover a much larger area than mining. Mining is limited to an area within 2 to 3 miles from the coal outcrop because of overburden-coal strip ratios. CBM development is projected to cover most of the Wyodak CBM project area.

Impacts to Aquifers Stratigraphically above the Coal: The sand aquifers of the Wasatch Fm are hydrologically separated from the Wyodak Coal by low permeability claystones. In mining, the shallower aquifers (the overburden) must be removed to access the coal. Impacts to these aquifers in the areas of actual mining are significant. Immediately adjacent to active mine pit areas, the Wasatch sands that are intercepted by mining may drain into the pit and become dewatered. The extent of Wasatch aquifer dewatering associated with mining is largely dependent on the continuity of the sand units in the vicinity of the mine, and whether these sand units are actually intercepted by mining. There are many examples of overburden monitoring wells, completed in relatively isolated sand units that show very little influence due to close mining. Mining also induces drawdown in coal aquifer water levels as described above. This drawdown, in turn, induces vertical leakage from the overlying Wasatch sands, contributing to drawdown in these sands.

During CBM development, the Wasatch sand aquifers are not directly impacted. Leakage from the Wasatch sands into the coal may be enhanced by CBM development because water levels in the coal are lowered as a result of partial coal dewatering. Due to the limited hydraulic communication between the coal and the overlying Wasatch sands, a significant period of time (typically several years), may pass before significant drawdown effects in the sands are apparent. Drawdown effects in the Wasatch sands are projected to be in the range of 10 to 20 feet above areas of CBM development. As for coal drawdowns, the area of Wasatch sands impacted by CBM development will be much larger than that caused by mining due to the greater area of CBM development.

Changes in Infiltration Rates and Recharge: During mining, the overburden and coal aquifers are removed and replaced with backfill material. The recharge through the spoils is likely to be higher than the original undisturbed materials. During CBM development, the aquifers remain essentially undisturbed and the recharge mechanism is unchanged. Water discharged from CBM operations into creeks will increase recharge to alluvial aquifers and underlying Wasatch sands.

Changes in Groundwater Quality: After mining, the coal and Wasatch sand aquifers are replaced with mine spoils which have the potential to change the quality of the groundwater in the aquifer. During CBM development, water removed from the coal may recharge the alluvial and Wasatch sand aquifers. This has the potential for water quality changes as described earlier in Chapter 4. Generally, however, groundwater quality changes caused by CBM development are relatively minor.

Discharge of Produced Waters: Both mining and CBM development result in water collection and discharge to surface streams. Mine inflow water is first stored in sediment ponds to reduce sediment that is picked up in the pit and much of the water is used for dust suppression. The discharge water from sediment ponds is potentially higher in TDS and of lower quality due to sediment mixing and concentration by evaporation. CBM discharge is essentially sediment free, although discharge to creeks can increase sediment loading. Infiltration of discharged water can recharge the alluvial and shallow Wasatch sand aquifers, and potentially influence their water quality.

Subcoal Fort Union Aquifers: Mining may impact subcoal aquifers by influencing recharge water quality. Groundwater withdrawals from lower aquifers for mine use also may impact subcoal aquifers. CBM development may impact the subcoal aquifers by inducing upward leakage from them into the coal as a result of coal depressurization. These cumulative influences were included in the groundwater model and the results discussed in Chapter 4.

Existing Monitoring Programs

Monitoring programs required by LQD and administered by the mining companies have been established in the eastern PRB. Each mine is required to monitor groundwater levels in the coal itself as well as in shallower aquifers in the area surrounding their operations. There are also requirements for drilling monitoring wells in the backfill areas of the mines in order to record the water level recovery in these areas. In addition to the mine monitoring required by LQD, the WDEQ, WSEO, WOGCC, and the BLM have required water monitoring to be done for different aspects of CBM projects.

The Gillette Area Groundwater Monitoring Organization (GAGMO) is a voluntary group formed in 1980. The purpose of GAGMO is to assemble and report the hydrologic monitoring data being collected by the coal mining companies operating in the eastern PRB of Wyoming, from the Buckskin Mine north of Gillette to the Antelope Mine in northern Converse County. Members of GAGMO include most of the companies with operating or proposed mines in that area, the WDEQ, the WSEO, the BLM, the USGS, and the OSM, which joined in 1991. The Dave Johnston Mine near Glenrock is not a member of GAGMO.

Each year GAGMO contracts with an independent firm to publish the results of the monitoring for that year. In 1996 GAGMO published two reports--an annual report for 1995 and a 15-year report. The 15-year report, prepared by Hydro-Engineering, summarized the data accumulated during the past 15 years of monitoring in the PRB. According to that report, approximately 600 monitoring wells were operated at 20 operating or proposed coal mines in 1995 (Hydro-Engineering, 1996).

A major groundwater issue is the extent of the loss in hydraulic head in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 15-year report are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. Figure 4-3, taken from the GAGMO 15-year report, shows the changes in water levels in the coal seams after 15 years of monitoring (Hydro-Engineering, 1996). Figure 4-17 shows the area where actual decline in hydraulic head in the coal seam has been greater than 5 feet in 15 years, in comparison with the predicted worst-case five-foot decline derived from groundwater modeling done by the mines. The LQD requires the mining companies to determine the maximum probable extent of the five-foot drawdown line through modeling.

In general, drawdown in the coal does not extend east of the coal mines because the mines are located on or near the coal outcrop line. The actual 15-year, five-foot groundwater drawdown contours have not exceeded worst-case development drawdown predictions for the mines north and east of Gillette or for the mines east and southeast of Reno Junction (which includes the North Rochelle Mine). Drawdowns are reaching the predicted worst-case drawdown levels in the central group of mines, located between Gillette and Wright (Figure 4-17). This is because there is an overlap of drawdown impacts from coal mining and CBM development. The projected worst-case drawdown lines shown in Figure 4-17 are based on projected coal mining only.

Similarly, the actual five-foot drawdown levels are well within the cumulative drawdown levels predicted by the CHIA for the mines north and south of Gillette (USGS, 1988). However, actual drawdown levels have reached the CHIA's predicted cumulative drawdown level in the group of mines between Gillette and Wright because of overlapping CBM and coal mining impacts. The 1988 CHIA predicted the approximate area of five feet or more water level decline in the Wyodak coal aquifer that would result from "all anticipated coal mining." "All anticipated coal mining", as referred to in the 1988 CHIA, included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines were considered in the CHIA analysis (USGS, 1988). CBM development was not anticipated at the time that analysis was prepared. The 1988 CHIA concluded that water supply wells completed in the coal may be affected as far away as eight miles from mine pits as a result of the anticipated coal mining, but the effects at that distance were assumed to be minimal.

The additional groundwater impacts that would be expected as a result of the Wyodak CBM development would be additive in nature and would extend the area experiencing a loss in hydraulic head to the west of the coal mining area. The area between the CBM fields and the mines would be subjected to the cumulative impacts of these two distinct activities. The overlapping drawdown impacts of the two activities is additive. The 15-year GAGMO report (Hydro-Engineering, 1996) points out the area of apparent overlapping impacts between the Marquiss and Lighthouse CBM projects and the Caballo, Belle Ayr, Caballo Rojo, and Cordero mines (Figure 4-17). The groundwater flow model developed for the Wyodak CBM Project EIS, described in earlier Chapter 4, accounts for impacts due to both mining and CBM development.

Differentiation of Drawdown Effects from Coal Mining and CBM Operations

The differentiation of drawdown effects from coal mining and CBM operations also was simulated using the computer model. This was done by performing a simulation of mining effects alone, and then performing a separate simulation with the superimposed stresses of the CBM operations. The difference in projected drawdown in the coal may be attributed to the CBM operations.

The result of this differentiation is presented in the form of drawdown maps showing the drawdown attributed to CBM operations alone (Alternative 1) for the year 2007, the anticipated maximum drawdown year for CBM operations, in Figures 4-18 and 4-19. The maximum areal extent of drawdown, defined as a drawdown of at least five feet, ranges to the west about 25 to 30 miles from the centers of CBM development.

Comparison of drawdown extent due to CBM operations alone with that of combined CBM development and mining for the same year, (Figures 4-5 and 4-6), shows that CBM withdrawals are primarily responsible for drawdowns to the west of the major CBM developments. For the Upper Wyodak coal, the maximum predicted drawdown due to CBM operations is about 200 feet in the northern portion of the project area; it is about 200 feet in the central portion of the project area; and it is about 100 feet in the southern portion of the project area.

Proposed Monitoring Program

A proposed groundwater monitoring program has been outlined in Chapter 2 "Proposed Action and Alternatives". General locations for new monitoring wells are suggested. The modeling results confirm that most of the drawdown associated with CBM development will be concentrated in the area of dense CBM development. Drawdown in excess of 50 feet, which has the potential to impact water well yields and methane generation, extends up to 15 to 20 miles from areas of concentrated development. Monitoring wells should be located on the periphery of these development areas. Initially, monitoring wells should be located within the area where drawdown in excess of 50 feet is projected. Actual monitoring data will confirm the projections and will allow refinement of the model as development proceeds. Additional monitoring wells may be required farther from the development areas if drawdown exceeds projections.

Alternative 1

The cumulative impacts for groundwater resources will be similar to those described under the Proposed Action. However, additional CBM development, coupled with coal mining dewatering would expand the area of drawdown in excess of 50 feet to 15 to 25 miles from the centers of intense CBM development. Coal bed dewatering from coal mining would be a smaller component of the predicted dewatering than noted for the Proposed Action.

No Action

The general cumulative effects discussion on groundwater resources from the Proposed Action is similar for the No Action Alternative. However, the maximum drawdown would be approximately fifty feet less than under the Proposed Action, at more than 200 feet for the northern project area, and more than 100 feet in the southern area. The relative importance of coal mine dewatering to total dewatering would be greater under this alternative than under the two other alternatives.

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DEIS CHAPTER 4 ENVIRONMENTAL CONSEQUENCES ERRATA

Page No./Paragraph/Line	Errata
4-4 4 4	The text should read "The productive life of a CBM well has been estimated for a previous project to be 12 years (USDI BLM, 1997a). Based on current estimates and for the purposes of this analysis, a 15-year period has been selected to represent an individual CBM well production life.
4-4 5 8	The text should read "... before the 12 to 20 year ..."
4-5 2 4	Replace the second sentence in the second paragraph with the following: "If the maximum flow (0.22 cfs) were discharged continuously through a rectangular channel three feet wide, water depth in the channel would be only 0.7 inch along a channel slope of two percent, with a velocity of 1.24 feet per second."
4-5 5 1	The text should read "... only 12 to 20 years."
4-5 6 1	The text should read "... from 15.4 million gallons per day to a maximum of 67.2 million gallons per day..."
4-5 7 2	The text should read "...estimated 17,230 ac-ft per year in 1998 to 75,310 ac-ft per year..."
4-6 1 4, 5	The text should read "..., Proposed Action would triple the annual yield ..." Add the following sentence to the end of the paragraph: "Recharge to adjacent alluvial aquifers will result in higher water tables. In locales of previously elevated water levels, ponding or wetland development may occur."

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Page No./Paragraph/Line	Errata
4-7, Table 4-1	Footnote 1 should read "Only included drainage channels adjacent to or downgradient of CBM well fields within the Wyodak study area. The hypothetical locations of CBM well pods were considered in calculating the average drainage channel lengths." The following text should be added to Footnote 4: "Conveyance Loss is calculated as Total Produced Water Discharge in Drainage Basin ($0.99^{\text{\% drainage channel length}}$ x Total Produced Water in Drainage Basin). Outflow at the Wyodak Study area boundary is calculated as Total Produced Water Discharge in Drainage Basin - Conveyance Loss."
4-10 4 1	The text should read "Sediment concentrations in surface waters will increased if discharges......"
4-12 3 4	The text should read "Approximately 1,700 discharge points ..."
4-16 4 1	The text should read "...from 15.4 mgd to 101.8 mgd..."
4-16 5 2	The text should read "...estimated 17,230 ac-ft per year in 1998 to 114,030 ac-ft per year..."
4-17 4 1	The text should read "...estimated 15.4 mgd to 40.9 mgd..."
4-21 1 2	The text should read "... approximately 1972 (the earliest ..."
4-35 4 14	Delete sentence: "For individually impacted water wells, see the "Mitigation Measures" section."
4-44 3 3	The text should read "... duration of an estimated 15-year life from the range of 12 to 20 years for the life of a well."
4-62 3 9	Add sentence to end of paragraph: "The U.S. Environmental Protection Agency has the regulatory authority to control emissions from the mobile pollutant sources analyzed in this EIS."

Page No./Paragraph/Line	Errata
4-68 1 3	The text should read "... catalytic controlled rich-burn engines ..."
4-69 2 5	The text should read "The average annual NO_2 background ..."
4-71 4 2	The text should read "... complex, would address the risk of exposure to formaldehyde."
4-74 5 7	The text should read "For ammonium nitrate and ammonium sulfate the maximum ..."
4-85 5 4	The text should read "... not an activity regulated by the COE if the activity does not include a discharge of fill material into waters of the U.S. (US Army COE, 1998) (Appendix A)."
4-87 2 3	The text should read "... long-term, approximately 12 to 20 years."
4-89 1 9	The text should read "... levels, but may be initially displaced away from short-term CBM well drilling, well completion, and ancillary facilities construction."
4-89 2 8	The text should read "... potential for CBM production-related impacts."
4-89 3 1	Replace the first sentence with "Twenty six active and 35 inactive (5 year period) sage grouse leks have been identified within the project area; two active and two inactive sharptail grouse have also be identified."

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Page No./Paragraph/Line	Errata
4-94 1	Insert following paragraph after the first paragraph: "CBM produced water cannot be discharged until it meets WDEQ requirements for effluent limitations that are necessary for the continued safe consumption or use of water downstream by humans and other species. Therefore, impacts to the sturgeon chub population present in the Powder River (expanded project area) are not anticipated. Because of the low number of wells projected (in this analysis) to discharge into the tributaries of the Powder River (Table 4-1 on p.4-7), and the channel lengths of these tributaries where infiltration will occur, substantial flows of CBM produced water are not expected to reach the Powder River. The flows that do reach the Powder River are expected to remobilize channel sediments deposited as river flows decrease during the summer. As flows in the Powder River increase, the silt-carrying capacity of the river also will increase. The turbid nature of the Powder River is not expected to change during CBM development and production activities. The sturgeon chub, which has adapted its habitat to turbid waters of large rivers with gravel substrates, is not expected to be affected."
4-104 3 6	Add the following sentence at the end of the third paragraph: "Impacts to the Fortification Creek WSA will be analyzed site-specifically at the APD/POD level of analysis."
4-128 4	Insert the following text as a new paragraph following the fourth paragraph on the page: "Current information on the ongoing construction of the Thunder Creek and the Fort Union Gas Gathering pipelines, that will gather and ship CBM gas to market, identifies the approximate length of the Thunder Creek pipeline as being 74 miles, and its right-of-way width is 50 feet. Seeding by the contractor is scheduled for completion by the end of October, 1999. A number of landowners along the pipeline route have elected to do their own seeding, and their completion date cannot be estimated. An estimated 450 acres have been affected by short-term construction activities along this pipeline route. The Fort Union Gas Gathering pipeline is about 105 miles long, and its right-of-way width is 50 feet. An estimated 650 acres have been affected by short-term construction activities along this pipeline route. In all, an estimated 1,100 acres have been affected by construction activities for these two pipelines."

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Page No./Paragraph/Line	Errata
4-130 3 1	The text should read "... the next 12 to 20 years."
4-133 6 4, 7	The text should read "... water carried by the Powder and Little Powder rivers would ..." The text should read "... water storage in the Belle Fourche River's Keyhole Reservoir ..."
4-134 1 1, 2	The text should read "... approximate 4,000 acre Keyhole Reservoir nor ..." The text should read "The Cheyenne River's Angostura Reservoir ..."
4-135 2 4	The text should read "... higher in TDS due to sediment mixing ..."
4-151, Table 4-20	The heading of the second column should read "Type of Area"
4-158 3	The third paragraph is rewritten as follows: "Habitat disturbance and reclamation, the creation of barriers to movement, increased human presence, and mortality due to increased poaching and vehicle collisions involving pronghorn would produce cumulative impacts to pronghorn populations using the area. These impacts result from the combined effects of coal mining and other mining activities, conventional oil and gas development, and CBM development. These activities already are affecting pronghorn. Additional CBM development would increase the acres of habitat disturbed, but is not likely to create additional barriers to movement. Human populations associated with CBM development may become involved in poaching, vehicle/pronghorn collisions, and disturbance of animals."

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AIR QUALITY IMPACT ANALYSIS TECHNICAL REFERENCE DOCUMENT ERRATA

Page No./Paragraph/Line	Errata
i 3 3	The text should read "At that time additional site specific air quality analyses, such as Best Available Control Technology analysis of Prevention of Significant Deterioration increment analysis, may be performed."
ii 4 5	The text should read "... considered the mean of the cleanest 20% background visibility data ..."
2-1 1 9	The text should read "... catalytic controlled rich-burn engines ..."
2-8 1 1	The text should read "... Gillette NO_2 monitoring."
5-29 1 1	The text should read "... operations, truck dumps, wind ..."
6-6 2 7	The text should read "Conversely, a computed deciview change on or greater than one day that exceeds 0.5 deciview is above the threshold of concern ("limit of acceptable change") for visibility impairment, and may, under some circumstances, be considered an adverse impact."

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CHAPTER 5
CONSULTATION AND COORDINATION

SCOPING PROCESS

The scoping process and public participation are addressed in the "Public Participation" section of Chapter 1 of this EIS.

DRAFT EIS COMMENTS

The BLM thanks all commentors for their interest in the coal bed methane EIS process.

The 52 comment letters submitted by the public and interested agencies during the 60-day comment period and shortly after the formal comment period closed on the Wyodak CBM Project DEIS have been reproduced in Appendix E, with each letter given a unique identifying number. Comments containing only opinions or preferences did not receive a formal response. All comments were considered and included as part of the BLM decision making process.

A response by comment category has been prepared. Substantive comments received have been summarized and organized in issue statements under the following comment categories:

- General (common to all resource categories)
- Water Resources
  - Groundwater
  - Surface Water
  - Wetlands
- Air Quality
- Geology, Mineral Resources, and Geologic Hazards
- Wildlife/Fisheries
- Land Use

The identifying numbers of all comment letters used to develop the issue statement for a comment category are listed at the end of each comment category. Issue statements and responses have been repeated in all comment categories where they are applicable.

Additional analysis and/or specific changes (errata) in the text of the DEIS are found in each chapter of this FEIS. Where the response to an issue statement indicates a change has been made in a particular chapter of this FEIS, that chapter should be consulted for the specific rewording, clarification, additional analysis, or new information.

ISSUE STATEMENTS AND RESPONSES BY COMMENT CATEGORY

The following section was summarized from substantive comments received on the BLM's Wyodak CBM Project DEIS from May 1999 to July 1999; refer to Appendix E for full text of all comments received.

General

General Issue Statements and Responses:

No Action Alternative

The No Action Alternative should not include any CBM wells in order to establish an accurate baseline for the study area.

Response:

The No Action Alternative considered in this analysis represents "no federal action" but includes connected actions related to CBM development that are outside the scope of this EIS. The proposed CBM development considered under the No Action Alternative represents fee and State wells, for which the BLM has no authority, and federal drainage wells, for which the BLM has no discretionary decision (or action to take) regarding whether to allow the development. Any decisions regarding non-federal development and federal drainage development are outside the scope of this EIS. This development is expected to occur regardless of the decisions that are made based on the analysis contained in this EIS. The information that was known about these connected actions (the development of non-federal CBM resources and federal drainage wells) when the scope of this EIS was determined has been incorporated within Chapter 2.

EIS Scope - Reasonably Foreseeable Development Scenario - Staged Development

More CBM development is anticipated than is analyzed in the EIS. As many as 15,000 to 20,000 CBM wells have been estimated by industry sources. CBM development is likely to occur outside the area considered in the EIS. All anticipated CBM development should be analyzed. NEPA requires an analysis of the cumulative effects of reasonably foreseeable actions, such as the future expansion of CBM and coal mining in the basin. In order to accurately address cumulative impacts from the project, the industry goal of 15,000 to 20,000 wells must be used. Anything less does not accurately depict the cumulative impacts from the project.

Because the impacts resulting from CBM development are difficult to predict for such considerable development, the BLM should consider a staged approach to CBM development, approving only a portion of the proposed development so that the implementation of CBM development can be adequately monitored and the environmental effects of staged development can be documented for use in future analyses.

The EIS must analyze the impacts of connected and cumulative actions such as transportation and utility corridors, rights-of-way, the construction of the Thunder Creek pipeline and the Fort Union Gas Gathering pipeline, and other high pressure pipelines that will be constructed to gather and ship CBM gas to market. The EIS should explain how the BLM will mitigate the environmental effects resulting from the many pipelines that will cris-cross the area.

Response:

The scope of CBM development considered in this EIS has been consciously set by the BLM, in order to complete detailed computed modeling of anticipated effects to groundwater and air quality. Computer modeling requires detailed analysis of a finite number of wells and compression facilities in order to project effects. While more CBM development is anticipated, it is not advisable at this time to add more CBM development to this analysis.

This analysis was intended to encompass all reasonably foreseeable CBM development in the eastern PRB when it was begun in 1998, but perhaps three or four times that level of activity may be anticipated at the present time (August, 1999). Such a "moving target" for project scope does allow this EIS analysis to represent a staged development plan for CBM activities. The Proposed Action and Alternative 1 are staged development alternatives as they would be implemented. The BLM will approve CBM projects over time. The estimate of 400 APDs that likely could be approved in a year is low based on recent auxiliary funding obtained by the BLM for management of CBM development activities. As the level of cumulative impacts analyzed in this EIS is surpassed, another development stage (a regional EIS for as yet unspecified development levels) will be analyzed. The BLM is actively pursuing this issue and is seeking budget to analyze all reasonably foreseeable mineral and energy resource development in the PRB in a basin-wide analysis subsequent to this one.

Less than ten percent of the land surface in the 3,600 square mile area analyzed in this EIS is federally owned and administered by the BLM; only two percent of the land surface is federally owned and is administered by the FS. Neither the BLM nor the FS has any authority to conduct transportation or utility planning where the surface is privately owned.

More information now is available regarding the Thunder Creek pipeline and the Fort Union Gas Gathering pipeline that will gather and ship CBM gas to market. The approximate length of the Thunder Creek pipeline within the Wyodak study area is 74 miles, and its right-of-way width is 50 feet. Seeding by the contractor is scheduled for completion by the end of October, 1999. A number of landowners along the pipeline route have elected to do their own seeding, and their completion date cannot be estimated. An estimated 450 acres have been affected by short-term construction activities along the pipeline route. The Fort Union Gas Gathering pipeline is about 106 miles long within the Wyodak study area, and its right-of-way width is 50 feet. An estimated 650 acres have been affected by short-term construction activities along this pipeline route. In all, an estimated 1,100 acres have been affected by pipeline construction activities.

The preceding paragraph has been added as the fourth full paragraph on page 4-128 of the DEIS, to clarify the cumulative effects of pipeline construction. Each future pipeline that represents a federal action will be analyzed site-specifically by the BLM and/or FS as soon as enough information is available to begin the analysis.

Level of Detail in EIS - Site-Specific Information

More specific information should be in the EIS, not included in subsequent APDs or Sundry Notices. Information should be available to the decision maker and public before the decision is made.

Water management plans that describe how water will be managed on a drainage-by-drainage basis should be included in the EIS so they are available for review and comment by agencies and the public. Detailed and specific water management plans should be developed for each of the major drainage in the analysis area. Plans should identify areas off-limits to disposal of produced water, such as closed basins and playas; identify suitable disposal sites, including shallow and deep aquifers; and should include a mitigation and monitoring plan.

The EIS should disclose whether suitable habitat is available in adjacent areas for wildlife populations displaced by CBM development activities.

The EIS should identify suitable locations for siting of production pods. It is important that pods be sited to avoid sensitive surface resources (e.g. wetlands, erosive soils, wildlife habitat) and potential conflicts with other uses.

The EIS should include a transportation plan showing preferred corridors and alternatives that minimize environmental impacts and resource conflicts. Major access roads and utility corridors serving the project area should be identified and selected to result in the least impact.

Response:

The Wyodak CBM Project EIS is, by design, a programmatic analysis of the environmental effects that may be expected to occur as a result of CBM development activities. During intense and widespread development activities, the environment can be expected to be affected on several levels or scales. Frequently, National Environmental Policy Act (NEPA) analyses, like this EIS, are prepared first (or staged) to address widespread and cumulative environmental effects. This type of analysis presents an overview or an accumulation of the environmental effects of CBM development. Site-specific analysis, using detailed natural resource data, follows in a later analysis that is tied (or tiered) to this EIS.

The analysis done for this EIS is not a site-specific regulatory permit determination. Computer modeling for the programmatic analysis of a project area containing over two million acres, even though very detailed, is much more generalized than site-specific modeling done to analyze a single coal mine permit application that my involve several thousand acres. To accurately evaluate potential impacts, computer modeling utilizes some very detailed information and assumptions. As a result, there can be some confusion over whether this EIS represents a programmatic environmental analysis or a site-specific environmental analysis, such as the analysis done to permit a specific CBM well, a specific coal mine, or a specific power plant. The Wyodak CBM Project EIS is a programmatic analysis that evaluates the potential impacts associated with a reasonably foreseeable level of development over a 2.3 million acre area. Therefore, even an overview of the issues and environmental effects of CBM development is very complex.

The analysis done for this EIS supports a programmatic NEPA analysis, not a site-specific analysis that could be used to support decisions relating to a specific CBM well or group of CBM wells. Detailed natural resource data on wildlife and fisheries populations and habitats in a specific area would be utilized in the APD/POD level of environmental analysis. As this EIS is programmatic in nature, site-specific resource information typically is not presented in Chapter 3 (Affected Environment) section. Typical environmental effects, including widespread or cumulative environmental effects are presented in Chapter 4 (Environmental Consequences). Mitigating measures that are broadly applicable to all action alternatives are presented in Chapter 2. Analysis of a specific area that would be affected by a group of proposed wells or other facilities would be tied (or tiered) to this EIS at the APD/POD level of analysis.

Site-specific inventory, analysis, and mitigating measures will be applied to projects at the APD/POD level of analysis so that wildlife impacts, such as those to sage grouse or migratory birds, are mitigated below the level of concern or are addressed in site-specific environmental analyses. Availability of suitable habitat in adjacent areas for displaced wildlife populations must be analyzed site specifically, so that resource inventories can be reviewed. Mitigation measures and consultation with agencies such as the U.S. Fish and Wildlife Service, requested by commentors, already are agency commitments under existing BLM policy. For species that are intolerant of longer-term disturbances, a buffer zone is utilized per standard BLM Wyoming State Office policy.

Although some sensitive resource areas can be identified early, through oil and gas lease stipulations, suitable well pod locations must be determined site-specifically. The identification of suitable locations for production pods is accomplished at the APD/POD level of analysis when resource inventories are reviewed. At the discretion of the surface owner, pods will be sited to avoid sensitive surface resources and conflicts with other uses.

Where rights-of-way, pipelines, utilities, and roads are proposed on federal surface, the BLM will analyze these proposals site-specifically (individually or collectively, as appropriate). Where federal mineral leases under private surface ownership are involved, the BLM will meet its responsibility as conservator of the federal mineral estate, and will ensure that transportation and utility corridors are developed in a safe and environmentally sound manner. However, once the methane gas passes through a metering point that is either on-lease or off-lease, the BLM has no authority to regulate the corridors along which it is moved to market, unless federal surface is crossed.

Residual Impacts

Impacts that may be present after the project's completion (residual impacts) are not identified and evaluated in the DEIS.

The EIS should address the long-term impacts to groundwater levels over time as CBM development occurs.

Response:

Residual impacts are described at various locations in Chapter 4 (Environmental Consequences). For example, residual impacts to vegetation and related resources are described on p. 4-155, 4-156, and 4-157 of the DEIS. Coal aquifer drawdown over time (to the year 2200) is plotted on p.4-23 and is described on p. 4-14 of the FEIS.

Mitigation Plan

Under NEPA, the BLM is required to present a plan for mitigation in the EIS and it has to be available for public comment. There is a lack of a plan for mitigation of impacts in the EIS. Some data is fragmented and hard to find. Mitigation plans are deferred for review in APDs and Sundry Notices, which are not included in the EIS and are not subject to public comment as required by NEPA. The costs to implement the mitigating measures identified and the effectiveness of the mitigating measures included in the analysis should be included in the EIS.

Response:

The BLM agrees that mitigating measures which would be considered as conditions of approval (mitigation plan) at the APD/POD level of analysis are listed separately in various Chapter 4 sections and in Appendix B. This document organization may make it difficult for a reader to develop a comprehensive understanding of the mitigation plan that would be developed at the APD/POD level of analysis. A compilation of specific mitigating measures that would be considered under any action alternative at the APD/POD level of analysis has been incorporated within Chapter 2. These mitigating measures would supplement the BLM's standard conditions of approval (an APD mitigation plan) that are presented in Appendix B.

The permit requirements (in total) for a CBM well, consisting of the APD conditions of approval developed site-specifically by the BLM, the surface use plan (including a water management plan) prepared by the CBM operator, and the permit requirements of various agencies such as the WDEQ (AQD and WQD), WSEO, WOGCC, and COE, are the mitigation plan for that well. The specific requirements contained in mitigating measures would vary depending on site conditions. The applicability, cost to implement, and effectiveness of a particular mitigating measure can only be determined site-specifically. Some mitigating measures are not within the authority of the BLM to require or implement, and are so noted in the compilation.

(B)

APDs are posted for public review during a 30 day period upon receipt by BLM. A site-specific environmental analysis which addresses the cumulative effects of all wells within a POD is conducted by the BLM. That analysis complies with NEPA requirements and is available to the public for review.

Project Life/Life of a CBM Well

There is a lack of consistency in the document regarding the descriptions of the productive life of a CBM well and the expected life of the project.

Response:

The estimates for the productive life of a CBM well and the productive life of the project used for the purposes of this analysis have been clarified in Chapter 2 (FEIS, p.2-8). The rationale for these estimates is explained. The document text has been corrected at several locations for consistency.

Well Spacing

The well spacing could be different. Both more dense and less dense well spacings should be analyzed in the EIS.

Response:

The Wyoming Oil and Gas Conservation Commission (WOGCC) has the authority to set well spacing in Wyoming. The current CBM well spacing of 40 acres set by the WOGCC was used for the purposes of this analysis. While well spacing for CBM could become less dense in the future (80 acres), it is not likely to become more dense.

Applicable Comment Letters (General):

1, 7, 8, 9, 11, 15, 16, 18, 19, 23, 26, 28, 29, 34, 38, 43, 44, 50

Water Resources

Groundwater Issue Statements and Responses:

Groundwater Analysis - Modeling

The accuracy of the projected groundwater drawdown levels in response to CBM development is questioned. Related impacts to drinking water, livestock supply wells, coal industry monitoring wells, and (potentially) nearby in-situ uranium mining activities should be adequately addressed in the analysis.

The groundwater model is not calibrated with sufficient accuracy to be reliable as a predictive tool for future impacts. In particular, the steady-state (pre-mining) model water levels were one to two hundred feet different from actual water levels. This led to over-prediction of drawdown due to CBM development because of greater available drawdown.

The model is based on the Little Thunder stochastic model as well as the models used in the Lighthouse and Marquiss environmental impact analyses. These models showed poor calibration and their use in developing the Wyodak DEIS model likely contributed to the DEIS model's calibration problem.

Groundwater modeling relies heavily on hydraulically 'isolating' the coal layers from underlying and overlying aquifers. Confining layers have been assigned very low hydraulic conductivities, apparently uniformly. Field lithologic or hydrologic data do not support the presence of a laterally continuous confining unit with such a low hydraulic conductivity (1×10^{-10} meters per second) throughout the Powder River Basin.

Estimates of quantities of water that will be pumped out by CBM development are not compared with the quantity of groundwater in storage, recharge rates, or any other values that could affect water level recovery.

The model did not use the large amount of data currently available through the GAGMO database. Only 44 wells completed in the coal layer were used for model calibration despite the modeling domain of almost 20,000 sq. mi.

The average pumping rate of 12 gpm for the life of a CBM well was questioned as being representative of the entire area and as being appropriate for use in the model as the average water production rate for all wells. Several wells drilled in the western parts of the basin are reportedly producing at much higher rates.

The model does not take into account structures (faults and lineaments) and variable permeability within the coal. The failure to account for structures may explain much of the error in the modeled results.

The groundwater model did not include the Tongue River Member of the Fort Union Formation as an aquifer unit. It therefore cannot take into account the impacts to this unit which is used for water supply in the Gillette and Wright areas. Also, references to the Tullock Member being the major source of groundwater for municipal wells are not correct.

The model does not accurately simulate the overburden (Wasatch Fm) geology. The model's predictions overestimate the effect due to mining and underestimate the effect due to CBM development.

Response:

The groundwater model was re-calibrated in steady-state for the pre-mining condition. The revised calibration is accurate to within +/- 15 feet for most locations. There are a few areas where modeled and actual water levels may differ by as much as +/- 50 feet. However, it should be noted that the pre-mining data from these wells is acknowledged to be questionable. In many cases, the water level data actually post-date mining but are assumed to be representative of pre-mining data because they are sufficiently far from mining operations at the time that the data was collected. This level of accuracy for calibration is believed to be reasonable given the regional nature of the model with a grid spacing of about ¼ mile. The model should not be expected to match water levels accurately at a smaller scale such as a mine site. An improved pre-mining calibration has resulted in much lower predicted drawdowns due to mining and CBM development in comparison to results presented in the DEIS and supporting groundwater technical reference document. The transient calibration of the model to monitored water level changes resulting from mining and CBM development has also been revised. The revised transient calibration is accurate to within +/- 20 feet for most locations.

The data compilation that was used in the Little Thunder, Lighthouse and Marquiss models was reviewed; however, the Wyodak CBM Project EIS model was developed entirely from scratch (FEIS, p. 4-3 and 4-4). Changes to the references in the Technical Report have been made to clarify this point.

The entire GAGMO historical water-level database was imported into the Wyodak model to improve the calibration of the model over the large domain.

A review of Wyoming Oil and Gas Conservation Commission (WOGCC) data for CBM wells as of May 1999 indicates that the current average produced water yield for a CBM well is 12.4 gpm. However, there is wide variation in reported well yields, as well as some anomalies in the data. There are no obvious patterns of higher yields in certain areas, and there is very limited data for wells in western parts of the PRB. Based on current information, the 12-gpm-average rate of water production for the operating life of a well is a supportable, best estimate.

Faults and lineaments have been further defined in the revised model as part of the re-calibration effort. The coal units, underlying Tongue River Member, overlying Wasatch Fm., and the intervening layers, all have variable hydraulic characteristics. The revised model includes far more variability in these hydraulic input parameters than the earlier version, which has resulted in an improved calibration to both steady-state and transient-state conditions.

The groundwater model has been revised to include the Tongue River/Lebo Shale Members as the lowermost layer (layer 8) of the model. A layer (layer 7) of variable permeability separates the Tongue River from the Lower Wyodak coal (layer 6). Pumping wells representing the City of Gillette, Wright, and several of the major subdivisions in the vicinity of Gillette were added to the model. These water supply wells are screened in the lower layer of the model. Data for locations, screened intervals and pumping rates were provided by the City of Gillette and their contractor

Wester-Wetstein & Associates, and by the Wyoming Water Development Commission. The revised model will allow the influence of the CBM development on the Tongue River Member to be assessed. The connection between the Tongue River and The Lower Wyodak can be varied in the model by changing the vertical permeability of the intervening confining unit (layer 7). References in the EIS that identified the Tullock as being the major source of groundwater for municipal wells have been changed to reflect the correct situation.

The model of the overburden sands is necessarily simplified because of the variability of the Wasatch. Even the more detailed mine models often do not attempt to address the overburden due to its variability. The EIS model's predicted overburden water level changes are generalized, and the model, being regional in scope, should not be expected to project water levels that precisely match local area conditions. However, the potential influences of mining and CBM development on the Wasatch (overburden sand) water levels require analysis. Although data are limiting for the overburden sands, available data from both the GAGMO database and the BLM monitoring wells were used to improve calibration.

Injection of Produced Water

The EIS should evaluate injecting the produced water elsewhere in the basin for long-term storage (e.g. water banking).

It is not clear why produced water can't be injected into the Wasatch Sand Aquifer, particularly when recharge from surface disposal is anticipated (DEIS, p. 4-43).

DEIS, p. 2-26: Consideration also should be given to injecting produced CBM water to the Lower Ft. Union Formation aquifers in the Tullock Member. The City of Gillette has conducted a short term feasibility study with very encouraging results. (See Wester-Wetstein Association report to the City of Gillette, April 20, 1999)

Response:

The discussion regarding injection of produced water underground in Chapter 2 (FEIS, p. 2-27) has been clarified. Injection of large quantities of produced water underground in the PRB is being researched, but is not a viable alternative at present. Injection requires that the receiving formation be capable of accepting the quantity of water being injected. Injection of CBM produced water into the Wasatch Formation above the coal seam has not been tested. Injection into aquifers within the Tullock Member of the Ft. Union Formation has been studied by the City of Gillette, with encouraging preliminary results. The BLM will continue to monitor this study as a possible means of future disposal of produced water. Disposal of produced water in Wyoming currently is limited to aquifers exempt from the definition of fresh and potable water. Injection of this water into an exempt formation, as allowed under current regulations, would make water now suitable for livestock use unusable.

Water Well Agreement

The BLM should modify the Water Well Agreement.

The BLM should require the Water Well Agreement.

The BLM has no authority to require the Water Well Agreement.

Response:

The existing Water Well Agreement format was developed by a working group of affected landowners and industry representatives. The BLM was not and is not a party to this agreement. However, the BLM requires that CBM operators on federal leases offer this agreement to affected landowners. If landowners do not accept the Water Well Agreement, water well mitigation would be accomplished in accordance with state law (FEIS, p. 2-17).

Shallow Groundwater in the Gillette Area

The EIS does not address the potential impact of increased discharges from CBM development and subsequent infiltration of water into zones of shallow groundwater accumulation in the Gillette area. These areas of shallow groundwater already have posed a significant problem to structures in the Gillette area.

Response:

The analysis contained in the FEIS (p. 4-38) has been modified to address the shallow groundwater conditions in the Gillette area. The discharge of CBM produced water into drainages in the Gillette area could add to the existing problems related to shallow groundwater. The ongoing pumping of shallow groundwater would have to continue and likely would need to increase in rate in order to maintain acceptable groundwater levels in the Gillette area for the life of the contributing CBM well water discharges.

Moyer Spring

A large buffer should be established around Moyer Spring until further studies are conducted to ensure the spring is protected. Otherwise, CBM development in the area could severely impact the spring before the relationship between the coal and the clinker is understood. The Land Quality Division of WDEQ has conditioned the Dry Fork Mine Permit to leave a buffer of coal next to the clinker to provide additional protection until the interaction between the coal and the clinker is better understood.

Response:

Moyer Spring (T.51N., R.71W., Section 30, 6th P.M.) is not located within the Wyodak EIS area (the project area under the Proposed Action or the expanded project area under Alternative 1). No indirect impacts to the spring are anticipated (FEIS, p. 4-30 and 4-37).

Groundwater Withdrawal, Methane Migration and Seepage, Aquifer Collapse, and Underground Fires

Groundwater withdrawal associated with CBM production may effect the release of methane and possibly H_2S from seeps or existing residential, livestock, and coal-monitoring wells. There is no understanding of the effects that dewatering the coal seam will have on the subsurface. These effects could include lowered water levels and yields in nearby water wells, aquifer collapse, ground subsidence, methane seepage into homes or water wells, and underground fires.

Response:

Seepage of methane and methane hazards in water wells within the PRB were discussed in the Geology and Mineral Resources section of the DEIS's Chapter 4 Environmental Consequences. Methane migration and seepage could occur within the PRB. Limited information is available for use in characterizing methane mobility and anticipated movements in the PRB over time. Experience from the PRB has shown that methane seeps involving potentially explosive concentrations of methane can occur in the vicinity of near-surface coals seams (DEIS, p. 4-2 and DEIS references Glass et al., 1987 and Jones et al., 1987). Conditions for methane release will be dependent on site-specific geologic conditions and/or the specific well development conditions that remain after construction. H_2S is not a constituent of CBM in the PRB; and therefore, does not pose a risk to human health or the environment.

Where unconsolidated alluvial aquifers have collapsed in other geographic areas due to dewatering, significant ground subsidence has occurred. The Ft. Union Formation is a consolidated rock unit, and is only being partially dewatered to the top of the coal seam.

Coal mining has been ongoing in this area for more than 20 years, and has resulted in the partial dewatering of the coal beds that are downdip from the coal mines, but no underground fires have occurred as a result. Along the coal outcrop there has not been an increase in spontaneous fires as a result of adjacent coal mining or CBM development occurring to date. Combustion has been associated with water level drops in unconfined coal aquifers (DEIS, p. 3-5), however, CBM development in the PRB is occurring under confined conditions.

Uranium

CBM development and associated production of water may adversely affect the ability to mine uranium by in-situ leach mining procedures. Any reduction or loss of the natural water table (hydrostatic pressure) within the permeable host sandstones, which contain the uranium deposits, reduces the solubility of dissolved oxygen and causes a geometric reduction in uranium production. Oxygen and carbon dioxide are reactants that dissolve and stabilize the uranium in the water. If the water table drops to or below the depth of the uranium deposit, in-situ leach recovery methods become physically and chemically impractical. As CBM development involves the reduction in hydrostatic pressure with in the target coal seam and aquifer, any hydraulic connection between the coal aquifer and the uranium bearing sandstones may adversely impact the ability to extract the uranium resource.

Response:

Subsurface uranium deposits located near the southwestern portion of the Wyodak study area are associated with Wasatch Formation sandstones (DEIS, p. 4-3). CBM development in the PRB is occurring under confined conditions. Withdrawal of CBM and water from the stratigraphically lower Ft. Union Formation would not be likely to affect the potential recovery of uranium resources.

However, depending on the proximity of operations and the local geologic conditions, CBM development could adversely impact the in-situ leach extraction process of uranium mining operations in the PRB. Coordination between the industries and with the appropriate regulatory agencies will be required to minimize adverse impacts to either industry and their energy resource recovery programs.

Conflicts between CBM development and uranium mining will be analyzed site-specifically at the APD/POD level of analysis, as APDs and plans of development for federal CBM wells are reviewed by the BLM. Site-specific mitigating measures relating to a specific CBM well or group of CBM wells will be developed based on that analysis.

Applicable Comment Letters (Groundwater):

1, 5, 7, 8, 12, 14, 15, 16, 19, 21, 23, 25, 26, 27, 28, 29, 31, 33, 34, 36, 37, 38, 39, 40, 42, 41b, 44, 45, 46, 49, 51

Surface Water Issue Statements and Responses:

Water Pollution Potential and Potential Toxic Pollutants

The discussion related to water quality of CBM produced waters focuses only on sediment and dissolved solids. There needs to be improved analysis of water pollution potential from TDS, sediments, and potential toxic pollutants. The FEIS should disclose the toxicity of discharges from existing CBM wells and estimate how many CBM wells are expected to have discharges which exhibit toxicity. The FEIS also should disclose the mitigation plans for toxicity, i.e., no pumping allowed until toxicity is removed or an alternative disposal method is installed. It is anticipated that there may be toxicity problems from iron, manganese, and salinity. A basic plan for mitigating water quality addressing the standard requirements for mitigation of sediment or treatment of toxic discharges should be included in the analysis. The FEIS should establish some trigger levels for constituents of water discharges.

Very low selenium levels can cause adverse effects in fish and waterfowl. Reservoirs or ponds created to retain the discharge of CBM produced water may create an attractive hazard to many species of birds and wildlife through the evaporative concentration of selenium. Water should not be stored in closed impoundments.

Response:

For federal wells, water quality standards and effluent limitations in NPDES permits are administered by the WDEQ. BLM administers its resource conservation and surface protection responsibilities. CBM wells, once drilled, cannot be produced until CBM produced water can be discharged in accordance with WDEQ and other agency requirements. CBM produced water cannot be discharged unless these requirements, including treatment if necessary, are met. WDEQ reviews NPDES applications on a case-by-case basis. The agency's NPDES permitting process, effluent limitations, and monitoring requirements for CBM produced water currently are being reevaluated.

In an NPDES application, the receiving waters and the proposed effluent (CBM produced waters) are characterized by the CBM operator. This analysis is specific to a limited area, and is presented to WDEQ as supporting information in order to obtain approval for the proposed CBM discharge. WDEQ analyzes water pollution potential and establishes effluent limitations (currently under review by WDEQ), water quality standards and aquatic standards under its authority from EPA to administer the federal Clean Water Act (as amended). These WDEQ requirements represent the water characteristics that are necessary for continued safe consumption or use of water downstream by humans and other species.

After an NPDES permit is issued, the effluent (CBM produced water) and the receiving waters downstream from the discharge point are monitored regularly by the CBM operator as specified by WDEQ and other agencies).

Characteristics of Surface Waters

The flow regimes, temperature, turbidity, and water chemistry anticipated as a result of CBM development should be disclosed and analyzed in comparison with the aquatic habitat required by species already inhabiting receiving waters (rivers and tributaries) downstream of the discharge points. Changes in pH, TDS, and salts are critical to fish and aquatic life. Since the discharge water quality is variable, specific analysis must be done and included in this EIS in order to accurately assess impacts to fish and aquatic life. Field scientific study, using water discharge data and projected ecosystem changes needs to be done to accurately assess impacts.

Response:

Limited existing information is available for use in characterizing the perennial receiving waters, flow regimes, and anticipated stream erosion downstream of the discharge points or the proposed discharges of CBM produced water. Environmental conditions between a discharge point and the perennial waters downstream will vary according to soil type, geology, existing stream flows, and other factors. Natural variations in the character of the produced water also will occur.

Localized conditions in existing downstream perennial waters could change as mixing of different types of water occurs, if produced water discharged directly into a drainage having perennial flow. Localized conditions are unlikely to change where discharge into an ephemeral drainage occurs. It is unlikely that existing turbid perennial waters downstream of discharge points will clear up.

Additional surface water monitoring sites will be established in order to collect information related to surface water characteristics, flow regimes, substrates, and aquatic habitats. Parameters such as water temperature, turbidity, or chemistry, that could affect the suitability of downstream waters as habitat for various aquatic species will be measured at these surface water monitoring sites. Monitoring related to specific habitats (such as sturgeon chub) will be incorporated within monitoring plans where suitable existing habitat may be affected by CBM activities.

Surface Flows - CBM Produced Water

Vast quantities of water will be discharged during CBM development. Realistic estimates were not used in the EIS for the number of wells and the volume of water produced. There is no specific mitigation plan or compensation plan for landowners in the EIS.

Response:

Larger volumes of water are produced from CBM wells at the onset of production and shortly thereafter. Later in the life of a CBM well, water production declines. Flow averages over the life of a well are used in this analysis to provide an estimate of cumulative groundwater withdrawal and surface water discharge.

Flow rates, annual flow volumes, and maximum instantaneous flows are projected by CBM operators in applications for groundwater appropriation permits. These values typically are somewhat overestimated to ensure that an adequate groundwater right is filed with the WSEO. Well completion reports document the actual flow when a well is completed. Monthly production reports filed with the WOGCC document water production over time during the life of a well.

The estimate of water production used in this analysis (CBM produced water) was compared to WOGCC production statistics for May 1999 that covered 902 producing CBM wells within the Wyodak study area. Producing CBM wells averaged 12.4 gpm per well of produced water in May 1999. An earlier WOGCC analysis of 500 producing CBM wells showed an average water production per well of 14.6 gpm.

Even through water production may vary within the PRB and over time as wells continue production, it is necessary to take a hard look at cumulative groundwater withdrawals and cumulative surface water discharges. In order to analyze water volumes and water flows, these values must be estimated, even though they may be variable. The BLM has used the available data and its best professional judgement to make a representative estimate of water production for use in this NEPA analysis.

A specific mitigation plan or compensation plan for landowners is outside the authority of the BLM. The existing Water Well Agreement contained in Appendix D of the DEIS represents one such plan. It was developed by a working group of affected landowners and industry representatives (FEIS, p. 2-17).

Water Management Plans

Water management plans containing site-specific information are essential to address impacts, use/storage, mitigation, and monitoring related to water resources. These plans should be limited to BLM jurisdictional lands, developed with public involvement, and included within the EIS.

Approval of any "hydrologic watershed analysis" would exceed the BLM's authority. The BLM does not have the authority to make approval of an APD/POD dependent on the treatment of non-jurisdictional lands (off-site mitigation) in the water management plan.

Response:

As described in Appendix B, a water management plan is site-specific to a CBM Project Plan of Development (POD) for a small group of APDs, and is properly part of the APD/POD level of analysis, not this programmatic analysis for the Wyodak CBM Project (refer to FEIS, p. 1-14 and 1-15, Chapter 2, and Appendix B). A water management plan and the surface use plan it accompanies are public documents. BLM posts the non-confidential portions of APDs, (which would include surface use plans and water management plans), publicly for 30 days upon receipt. This information is available to agency decision makers and the public.

Water management plans are analysis tools that the BLM will use to address cumulative impacts of a CBM POD and reasonably connected actions site-specifically within a watershed area. As conservator of the federal mineral estate (56 percent of the Wyodak study area), the BLM retains responsibility for ensuring that the federal mineral resource is conserved (not wasted), and is developed in a safe and environmentally sound manner. The BLM does not have jurisdiction over privately-owned surface lands.

Injection of Produced Water

The EIS should evaluate injecting the produced water elsewhere in the basin for long-term storage (e.g. water banking).

It is not clear why produced water can't be injected into the Wasatch Sand Aquifer, particularly when recharge from surface disposal is anticipated (DEIS, p. 4-43).

DEIS, p. 2-26: Consideration also should be given to injecting produced CBM water to the Lower Ft. Union Formation aquifers in the Tullock Member. The City of Gillette has conducted a short term feasibility study with very encouraging results. (See Wester-Wetstein Association report to the City of Gillette, April 20, 1999)

Response:

The discussion regarding injection of produced water underground in Chapter 2 (FEIS, p. 2-27) has been clarified. Injection of large quantities of produced water underground in the PRB is being researched, but is not a viable alternative at present. Injection requires that the receiving formation be capable of accepting the quantity of water being injected. Injection of CBM produced water into the Wasatch Formation above the coal seam has not been tested. Injection into aquifers within the Tullock Member of the Ft. Union Formation has been studied by the City of Gillette, with encouraging preliminary results. Disposal of produced water in Wyoming currently is limited to aquifers exempt from the definition of fresh and potable water. Injection of this water into an exempt formation, as allowed under current regulations, probably would make water now suitable for livestock use unusable.

Moyer Spring

A large buffer should be established around Moyer Spring until further studies are conducted to ensure the spring is protected. Otherwise, CBM development in the area could severely impact the spring before the relationship between the coal and the clinker is understood. The Land Quality Division of WDEQ has conditioned the Dry Fork Mine Permit to leave a buffer of coal next to the clinker to provide additional protection until the interaction between the coal and the clinker is better understood.

Response:

Moyer Spring (T.51N., R.71W., Section 30, 6th P.M.) is not located within the Wyodak EIS area (the project area under the Proposed Action or the expanded project area under Alternative 1). No indirect impacts to the spring are anticipated (FEIS, p. 4-30 and 4-37).

Applicable Comment Letters (Surface Water):

1, 6, 7, 8, 9, 9a, 9b, 9c, 11, 14, 15, 16, 18, 19, 22, 23, 24, 26, 27, 31, 32, 34, 35, 36, 38, 40, 41b, 43, 44, 45, 48, 49, 51

Wetlands Issue Statements and Responses:

Mitigation of Impacts to Wetlands

Fencing of wetlands and providing off-site watering for livestock would allow vegetation development and facilitate maintenance of water quality in key wetlands.

Where possible, wetlands and ponds should be built on accessible public land where recreational users can benefit from the development.

Response:

As the percentage of federally-owned surface lands in the Wyodak EIS area (the project area under the Proposed Action or expanded project area under Alternative 1) ranges from about eight to twelve percent, the implementation of protective federal statutes and policies regarding wetlands by surface management agencies such as the BLM and the FS will be limited. As stated on page 4-85 of the DEIS, in accordance with BLM policy surface disturbance is prohibited within 500 feet of wetlands unless an acceptable plan for mitigation of impacts developed and implemented. Disturbance of all wetlands is mitigated acre for acre. On private lands (most of the Wyodak EIS area) reclamation planning, including wetland mitigation, considers the landowners' goals for post-project land use.

Applicable Comment Letters (Wetlands):

6, 9, 9a, 34, 38

Air Quality

Air Quality Issue Statements and Responses:

Modeling - Air Quality Impacts

The data, assumptions, model settings (parameters), measuring points (receptors), and checks and balances (calibrations) used in computer modeling of impacts to air quality and air quality related values (the air quality analysis protocol) could have been selected to represent the impacts from future coal mining more accurately. The computer model, as used by the BLM, produced results that exaggerated the contributions of nearby coal mines to the projected cumulative impacts in the eastern PRB and surrounding areas, and would not be appropriate for use in coal permitting. The modeled impacts are not consistent with the observed effects of two decades of expanding coal mining activities.

All activities that would contribute to air quality impacts should be modeled, including, for example, vehicle traffic and controlled burns by land management agencies. Model results should

be compared with existing monitoring data to calibrate computer modeling with "real world" conditions.

Response:

This analysis, using the latest state of the art computer models and programmatic location of facilities, demonstrated that the air quality effects from the proposed Wyodak CBM Project alone would not lead to any violations of ambient air quality standards (State of Wyoming or Federal) or air quality related values at Class I or sensitive Class II areas with 230 kilometers of the Wyodak study area. Therefore, the BLM can make the determination that the proposed Wyodak CBM Project would not have significant adverse air quality impacts.

The cumulative impact analysis in this EIS evaluated all permitted and proposed new stationary point sources, including the proposed Wyodak project sources, all incremental increases in coal mining activities, and all increases in coal train emissions. The cumulative impact analysis demonstrated that adverse visibility impacts from regional haze may occur at Class I and sensitive Class II areas when all pollutant sources, currently permitted and reasonably expected to occur in 2015, are analyzed. WDEQ permitting analysis for a single point source facility typically does not consider all possible pollutant sources over a large area. The contribution to air quality impacts from each individual source may be insignificant.

Emissions from stationary sources and monitoring activities for these sources are regulated by the WDEQ. The WDEQ has the authority to set permit limits, mitigating measures, monitoring requirements, and BACT (Best Available Control Technology) for stationary sources.

The EPA has the authority to set permit limits, mitigating measures, monitoring requirements, and maximum allowable emission rates for mobile sources (including coal trains). The BLM does not have any authority to make decisions related to air quality emissions or monitoring.

The protocol for the air quality and air quality related values impact analysis done for this EIS was developed by an interagency committee Wyodak Air Quality Advisory Committee (WAQAC) that consists of air quality specialists from the Bureau of Land Management, National Park Service, U.S. Forest Service, Environmental Protection Agency, Wyoming Department of Environmental Quality, and BLM's contractor, Greystone. The regional haze visibility analysis, performed by EnviroNet AeroScience, LLC, followed the recommendations of the Interagency Workgroup on Air Quality Modeling (IWAQM) with the approval of WAQAC and specific input from National Park Service air quality specialists.

The data, assumptions, model settings (parameters), measuring points (receptors), and checks and balances (calibrations) used in computer modeling of impacts were selected to reasonably represent the impacts from CBM development and the cumulative impacts from other permitted and projected sources for which data were available. Data and assumptions were continually revised and updated throughout the analysis in an effort to utilize the best and most recent data and projected regulatory requirements whenever possible. Key points concerning modeling parameters and methods are discussed below:

- Receptors were placed within Class I and sensitive Class II areas on a 2.5 to 5 kilometer resolution. At the distances involved from the cumulative sources to the receptors, this resolution was considered adequate by the WAQAC.

- Coal train emissions were modeled as diffuse volume sources per the recommendations of the WAQAC and Earth Tech, Inc., the firm that developed and maintains the CALMET/CALPUFF model under contract from the EPA.

- Point sources were combined, when appropriate, to reduce computational time. Combinations used EPA-approved methods. Only sources at least 50 kilometers from a receptor were combined. At distances beyond 50 kilometers, the combination of point sources is valid methodology. Wyodak Project sources were combined within 10 X 10 kilometer areas. Cumulative sources were combined only if located on the same facility, i.e., a single property boundary.

- Background values for ammonia and ozone were selected from IWAQM guidance and further modified for the eastern Wyoming area by the WAQAC.

- Terrain and land use data were provided by National Park Service meteorologists. This data has been previously used for other CALMET/CALPUFF modeling projects.

- The chemical mechanism used in the Wyodak modeling analysis is the method recommended by the EPA for regulatory purposes.

- Comparisons of the results from the Wyodak CBM Project modeling with other CALMET/CALPUFF modeling analyses can be valid only if all parameters (total emissions, type of pollutants, location of emission sources, distance between sources and receptors, meteorology, topography, etc.) are virtually identical. Comparing apparently similar projects without an in-depth analysis of the projects is not scientifically valid.

- The analysis used 100 days per year with precipitation greater than 0.01 inches, a value that was interpolated from USEPA AP-42, Section 13.2.2.3, Unpaved Roads Controls, Figure 13.2.2-1 (dated 9/98). To further verify this parameter, Local Climate Data during the period 1960-1990 for three stations east of the Rocky Mountains in Wyoming were reviewed. These stations reported the following values for the number of days with precipitation greater than 0.01 inches: Cheyenne - 100.7 days; Casper - 95.8 days; and Sheridan - 106.8 days (Reference, Western Regional Climate Center via Internet http://www.wrcc.dri.edu).

The purpose of the analysis was to predict potential effects to air quality and air quality related values within and near the Wyodak study area and at distant Class I and sensitive Class II areas. The analysis examined expected contributions of nearby coal mines to the projected cumulative impacts in the eastern PRB and surrounding areas. As explained in Chapter 5 of the Wyodak CBM Project Air Quality Technical Reference Document (5/99), the increased emissions from coal operations were scaled to incremental increases in reasonably foreseeable coal production. Likely future emission reductions were not included in computer modeling for either CBM development or coal activities. Modeling considered CBM compressor emissions at levels higher than current WDEQ permitting limits, and coal train locomotive emissions at present conditions rather than considering anticipated regulatory reductions. As new information becomes available, it will be used in future coal and/or CBM documents to analyze air quality impacts predicted for the proposed actions.

The results of the analysis were presented in the formats requested by the agencies (specifically the National Park Service and the U.S. Forest Service). These formats do not draw attention to the results as representing projections or estimates or being an incomplete cumulative increment tracking analysis due to the cutoff emissions inventory year. The detailed results potentially may be confusing to a reader unfamiliar with the use of a computer model in environmental analysis. Introductory language has been added to Chapter 4 to emphasize the limitations of analysis using computer-generated projections and to explain that even though quantified results have been obtained from the computer modeling, these results represent an overview effort to assess and disclose BLM's best estimate of what these emissions might be in the future and what impacts this level of emissions might have on regional haze at distant Class I and sensitive Class II areas.

The best data available at the time the analysis was being conducted were utilized in the analysis. The BLM and the State of Wyoming were the primary data sources for coal information. Burlington Northern/Santa Fe provided fuel usage data and emission factors for a coal train per mile. The emission factor used is based on the pollutant emissions from three locomotives hauling 100 coal cars. Certain detailed projections and assumptions that would be considered in a site-specific regulatory permit determination were not considered in this programmatic analysis. It would not be appropriate to apply the methodology of this programmatic analysis to the analysis for a site-specific regulatory permit determination.

Regional Haze

Projections of regional haze occurring at National Parks, National Monuments, National Forest Wildernesses, and the Northern Cheyenne Reservation are unrealistically high worst case estimates and do not represent what is really expected to occur. Projected coal mining and transportation of coal by railroad in 2015 (reasonably foreseeable development scenario) and the impacts resulting from these activities were not accurately considered in the computer model. Transportation along the proposed DM&E railroad route was not considered.

There are new federal rules for regional haze. These new requirements should be addressed.

Response:

The non-CBM project analysis underestimated the impacts to regional haze by not including the diesel soot particulates and SO_2 emissions from the coal haul trains or the projected DM&E rail route, currently under consideration, that would pass very near some of the sensitive areas evaluated in this analysis. While rail transport to the east was considered for one-third of the reasonably foreseeable coal production in 2015 (DEIS, p. 4-107), rail transport specifically along the DM&E rail route currently under consideration was not included in the analysis since the DM&E route has not yet been approved. As new rail lines are established, future analyses will address emissions site-specifically.

New federal relations on regional haze require reductions in haze over time. The approach taken by the BLM in the Wyodak CBM Project EIS to identify potential problems in a widespread area through an overview analysis of potential regional haze impacts has strengthened interagency and stakeholder cooperation on air quality issues and has provided a starting point for proactive regional strategies to reduce regional haze.

Formaldehyde

There is a health (cancer) risk from potential formaldehyde emissions, especially near large compressor stations like the prospective 12,000-hp station containing eight 1,500-hp engines that was used as a basis for calculation of ambient air concentration levels of formaldehyde. Formaldehyde risk and appropriate mitigating measures should be adequately addressed.

Response:

The risk from exposure to formaldehyde must be examined site-specifically. This risk is dependent upon the size of the gas-fired compression facilities and their proximity to residences. The BLM's authority is limited to the siting of compressors on federal leases.

The authority for permitting stationary compressors, including control of emissions, rests with WDEQ. When air quality permits are considered by WDEQ, possible mitigation to lessen the risk of exposure to formaldehyde could include raising the stack to reduce ground level impacts or adding a CO catalytic oxidizer that would result in more complete combustion of natural gas and thus reduce the formation of formaldehyde (DEIS, p. 4-71).

Applicable Comment Letters (Air Quality):

1, 3, 12, 20a, 31, 37, 38, 39, 40, 44, 45, 47, 49, 51, 52

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Geology/Mineral Resources/Geo-hazards

Geology/Mineral Resources/Geo-hazards Issue Statements and Responses:

Multiple Mineral Development Conflicts (Coal/CBM)

Where CBM development will take precedence over future coal mining it will impair future growth in the coal industry and will cause an economic hardship to the largest industry in Campbell County for 15 years or more.

CBM development cannot be allowed to proceed unrestricted and impede or delay coal development in the PRB.

Response:

The BLM is working to minimize coal/CBM conflicts. Where new leasing for oil and gas is proposed within existing mine permit boundaries, a stipulation is being added to the oil and gas lease requiring the lessee to come to agreement with the coal company prior to CBM development. Where a new coal lease is being issued, similar language is being added to the coal lease requiring the coal lessee to work out an agreement with the oil and gas lessee that will allow all coal to be recovered. Where oil and gas leases already exist, the BLM is working with the two mineral lessees to develop an agreement to recover as much of the methane as possible before mining occurs.

Geo-hazards, Methane Migration and Seepage, Aquifer Collapse, and Underground Fires

There is no understanding of the effects that dewatering the coal seam will have on the subsurface. These effects could include lowered water levels and yields in nearby water wells, aquifer collapse, ground subsidence, methane seepage into homes or water wells, and underground fires.

Methane and hydrogen sulfide gas seeps, underground coal fires, explosive levels of methane in domestic water wells, and the contamination of homes in areas of coal mining and methane development has occurred in Wyoming and other states. Wyoming state officials have refused to do baseline testing for methane gas in water wells and homes.

Response:

Seepage of methane and methane hazards in water wells within the PRB were discussed in the Geology and Mineral Resources section of the DEIS's Chapter 4 Environmental Consequences. Methane migration and seepage could occur within the PRB. Limited information is available for use in characterizing methane mobility and anticipated movements in the PRB over time. Conditions for methane release will be dependent on site-specific geologic conditions and/or the specific well development conditions that remain after construction. H_2S is not a constituent of CBM in the PRP; and therefore, does not pose a risk to human health or the environment.

Where unconsolidated alluvial aquifers have collapsed in other geographic areas, due to dewatering, significant ground subsidence has occurred. The Ft. Union Formation is a consolidated rock unit, and it is not being substantially dewatered. The Ft. Union Formation is only being partially dewatered to the top of the coal seam.

Coal mining has been ongoing in this area for more than 20 years, and has resulted in the partial dewatering of the coal beds that are downdip from the coal mines, but no underground fires have occurred as a result. Along the coal outcrop there has not been an increase in spontaneous fires as a result of adjacent coal mining or CBM development occurring to date. Combustion has been associated with water level drops in unconfined coal aquifers (DEIS, p. 3-5), however, CBM development in the PRB is occurring under confined conditions.

Uranium

CBM development and associated production of water may adversely affect the ability to mine uranium by in-situ leach mining procedures. Any reduction or loss of the natural water table (hydrostatic pressure) within the permeable host sandstones, which contain the uranium deposits, reduces the solubility of dissolved oxygen and causes a geometric reduction in uranium production. Oxygen and carbon dioxide are reactants that dissolve and stabilize the uranium in the water. If the water table drops to or below the depth of the uranium deposit, in-situ leach recovery methods become physically and chemically impractical. As CBM development involves the reduction in hydrostatic pressure with in the target coal seam and aquifer, any hydraulic connection between the coal aquifer and the uranium bearing sandstones may adversely impact the ability to extract the uranium resource.

Response:

Subsurface uranium deposits located near the southwestern portion of the Wyodak study area are associated with Wasatch Formation sandstones (DEIS, p. 4-3). CBM development in the PRB is occurring under confined conditions. Withdrawal of CBM and water from the stratigraphically lower Ft. Union Formation would not be likely to affect the potential recovery of uranium resources.

However, depending on the proximity of operations and the local geologic conditions, CBM development could adversely impact the in-situ leach extraction process of uranium mining operations in the PRB. Coordination between the industries and with the appropriate regulatory agencies will be required to minimize adverse impacts to either industry and their energy resource recovery programs.

Conflicts between CBM development and uranium mining will be analyzed site-specifically at the APD/POD level of analysis, as APDs and plans of development for federal CBM wells are reviewed by the BLM. Site-specific mitigating measures relating to a specific CBM well or group of CBM wells will be developed based on that analysis.

Applicable Comment Letters (Geology/Mineral Resources/Geo-hazards):

4, 5, 9b, 12, 23, 26, 31, 33, 37, 38, 39, 41b, 44, 46

Wildlife/Fisheries

Wildlife/Fisheries Issue Statements:

Special Status Species

Improved analysis and consultation with agencies such as the U.S. Fish and Wildlife Service are needed for special status species.

Response:

Site-specific mitigating measures will be applied to projects at the APD/POD level of analysis so that wildlife impacts are mitigated below the level of concern or are addressed in site-specific environmental analyses. Mitigation measures and consultation with agencies such as the U.S. Fish and Wildlife Service, requested by Commentors already are agency commitments under existing BLM policy. For species that are intolerant of longer-term disturbances, a buffer zone is utilized per standard BLM Wyoming State Office policy.

Noise

Disturbance issues for wildlife species should include loss of habitat security due to noise and disturbance from humans/vehicles, not just ground breaking disturbance. Noise impacts need further study.

Response:

The Wyodak CBM Project encompasses a patchwork of private ranches interrupted by small parcels of public lands in a part of Wyoming where significant levels of mineral and energy resource development and production activities have been occurring for a long time. The low number of CBM project workers and the low level of daily activity throughout the project life make it unlikely that noise and disturbance from humans/vehicles will change significantly. Under Alternative 1 less than 800 people would work over a 3,600 square mile area during the initial development period of 3 to 5 years. After the initial development period, less than 400 people would be employed during production and maintenance activities across 3,600 square miles. Less than 500 vehicles would be dispersed over 3,600 square miles during the initial development period. After the initial development period, an estimated 260 vehicles would support production and maintenance activities (DEIS, p. 4-108).

Noise from stationary compressors can be analyzed site-specifically, but the BLM has very limited authority, which is limited to the siting of 380-hp compressors on federal leases. The authority for permitting stationary compressors, including control of emissions and noise, rests with WDEQ. Under current Wyoming laws, control of noise from stationary compressors would have to be implemented under municipal or county land use plans in order to limit the disturbance of nearby residents or wildlife populations.

Sturgeon Chub

Improved analysis for this species is needed. Much greater and more regular flows will occur in the Powder River, which supports the largest known reproducing population of sturgeon chub. The wells in these drainages will pump much more water than existing development on the eastern edge of the project. Industry estimates are over 100 gpm.

Response:

Because of the low number of wells projected (in this analysis) to discharge into the tributaries of the Powder River, and the channel lengths of these tributaries where infiltration will occur, substantial flows of CBM produced water are not expected to reach the Powder River. The flows that do reach the Powder River are expected to remobilize channel sediments deposited as river flows decrease during the summer. As flows in the Powder River increase, the silt-carrying capacity of the river also will increase. The turbidity of the Powder River is not expected to change during CBM development and production activities. The sturgeon chub, which has adapted its habitat to turbid waters of large rivers having gravel substrates, is not expected to be affected.

The following modifications to the DEIS text have been made.

> (Page 3-40) Limited existing information is available for use in characterizing aquatic habitats in perennial receiving waters, flow regimes, and anticipated stream erosion downstream of the discharge points or the proposed discharges of CBM produced water. A comparison of 1990's and 1960's fish survey data from the Missouri River basin indicated that the sturgeon chub has a stable or increasing distribution (Patton et al, 1998). This survey was restricted to native warm-water species in non-montane regions. An estimated 40 to 50 percent of the fish species surveyed indicated a possibility of declining distributions (Patton et al, 1998). Two aquatic habitat types were common among the species with declining distributions indicated in the study: turbid rivers having silt and sand substrates; and small-to medium-sized streams having relatively cool, clear water, and preferably having gravel substrates for spawning. Patton et al (1998) suggested that reservoirs and diversion dams may have stabilized flows and reduced silt loads in rivers, and that land management and irrigation practices may have increased turbidity and siltation in many small- to medium-sized streams.
>
> (Page 4-94) CBM produced water cannot be discharged until it meets WDEQ requirements for effluent limitations that are necessary for the continued safe consumption or use of water

downstream by humans and other species. Therefore, impacts to the sturgeon chub population present in the Powder River (expanded project area) are not anticipated. Because of the low number of wells projected (in this analysis) to discharge into the tributaries of the Powder River (Table 4-1 on p. 4-7), and the channel lengths of these tributaries where infiltration will occur, substantial flows of CBM produced water are not expected to reach the Powder River. The flows that do reach the Powder River are expected to remobilize channel sediments deposited as river flows decrease during the summer. As flows in the Powder River increase, the silt-carrying capacity of the river also will increase. The turbid nature of the Powder River is not expected to change during CBM development and production activities. The sturgeon chub, which has adapted its habitat to turbid waters of large rivers with gravel substrates, is not expected to be affected.

The following reference has been added: Patton, T., F.J. Rahel, and W.A. Hubert. 1998. Using Historical Data to Assess Changes in Wyoming's Fish Fauna. Conservation Biology, v.12, no. 5, p. 1120-1128.

The following mitigation measure has been added in Chapter 2: Additional surface water monitoring sites will be established in order to collect information related to surface water characteristics, flow regimes, substrates, and aquatic habitats. Monitoring related to specific habitats, such as those of the sturgeon chub, will be incorporated within monitoring plans at the site-specific APD/POD level of analysis where suitable existing habitat may be affected by CBM activities.

Water Management Plans

The management and proposed beneficial use of CBM produced water should be addressed in a water management plan that is a public document and is part of the EIS. The impact of new water flow into waters that support fisheries and aquatic habitat should be addressed.

Response:

As described in Appendix B, a water management plan is site-specific to an APD or a small group of APDs, and is properly part of the APD/POD level of analysis, not this programmatic analysis for the Wyodak CBM Project (refer to FEIS, p. 1-14 and 1-15, Chapter 2, and Appendix B). A water management plan and the surface use plan it accompanies are public documents. BLM posts the non-confidential portions of APDs, (which would include surface use plans and water management plans), publically for 30 days upon receipt. This information is available to agency decision makers and the public.

Water Pollution Potential and Potential Toxic Pollutants

The discussion related to water quality of CBM produced waters focuses only on sediment and dissolved solids. There needs to be improved analysis of water pollution potential from TDS, sediments, and potential toxic pollutants. The FEIS should disclose the toxicity of discharges from existing CBM wells and estimate how many CBM wells are expected to have discharges which exhibit toxicity. The FEIS also should disclose the mitigation plans for toxicity, i.e., no pumping allowed until toxicity is removed or an alternative disposal method is installed. It is anticipated that there may be toxicity problems from iron, manganese, and salinity. A basic plan for mitigating water quality addressing the standard requirements for mitigation of sediment or treatment of toxic discharges should be included in the analysis. The FEIS should establish some trigger levels for constituents of water discharges.

Very low selenium levels can cause adverse effects in fish and waterfowl. Reservoirs or ponds created to retain the discharge of CBM produced water may create an attractive hazard to many species of birds and wildlife through the evaporative concentration of selenium. Water should not be stored in closed impoundments.

Response:

For federal wells, water quality standards and effluent limitations in NPDES permits are administered by the WDEQ. BLM administers its resource conservation and surface protection responsibilities. CBM wells, once drilled, cannot be produced until CBM produced water can be discharged in accordance with WDEQ and other agency requirements. CBM produced water cannot be discharged unless these requirements, including treatment if necessary, are met. WDEQ reviews NPDES applications on a case-by-case basis. The agency's NPDES permitting process, effluent limitations, and monitoring requirements for CBM produced water currently are being reevaluated.

In an NPDES application, the receiving waters and the proposed effluent (CBM produced waters) are characterized by the CBM operator. This analysis is specific to a limited area, and is presented to WDEQ as supporting information in order to obtain approval for the proposed CBM discharge. WDEQ analyzes water pollution potential and establishes effluent limitations (currently under review by WDEQ), water quality standards and aquatic standards under its authority from EPA to administer the federal Clean Water Act (as amended). These WDEQ requirements represent the water characteristics that are necessary for continued safe consumption or use of water downstream by humans and other species.

After an NPDES permit is issued, the effluent (CBM produced water) and the receiving waters downstream from the discharge point are monitored regularly by the CBM operator as specified by WDEQ and other agencies).

Characteristics of Surface Waters

The flow regimes, temperature, turbidity, and water chemistry anticipated as a result of CBM development should be disclosed and analyzed in comparison with the aquatic habitat required by species already inhabiting receiving waters (rivers and tributaries) downstream of the discharge points. Changes in pH, TDS, and salts are critical to fish and aquatic life. Since the discharge water quality is variable, specific analysis must be done and included in this EIS in order to accurately assess impacts to fish and aquatic life. Field scientific study, using water discharge data and projected ecosystem changes needs to be done to accurately assess impacts.

Response:

Limited existing information is available for use in characterizing the perennial receiving waters, flow regimes, and anticipated stream erosion downstream of the discharge points or the proposed discharges of CBM produced water. Environmental conditions between a discharge point and the perennial waters downstream will vary according to soil type, geology, existing stream flows, and other factors. Natural variations in the character of the produced water also will occur.

Localized conditions in existing downstream perennial waters could change as mixing of different types of water occurs, if produced water discharged directly into a drainage having perennial flow. Localized conditions are unlikely to change where discharge into an ephemeral drainage occurs. It is unlikely that existing turbid perennial waters downstream of discharge points will clear up.

Additional surface water monitoring sites will be established in order to collect information related to surface water characteristics, flow regimes, substrates, and aquatic habitats. Parameters such as water temperature, turbidity, or chemistry, that could affect the suitability of downstream waters as habitat for various aquatic species will be measured at these surface water monitoring sites. Monitoring related to specific habitats (such as sturgeon chub) will be incorporated within monitoring plans where suitable existing habitat may be affected by CBM activities.

Surface Flows - CBM Produced Water

Vast quantities of water will be discharged during CBM development. Realistic estimates were not used in the EIS for the number of wells and the volume of water produced. There is no specific mitigation plan or compensation plan for landowners in the EIS.

Response:

Larger volumes of water are produced from CBM wells at the onset of production and shortly thereafter. Later in the life of a CBM well, water production declines. Flow averages over the life of a well are used in this analysis to provide an estimate of cumulative groundwater withdrawal and surface water discharge.

Flow rates, annual flow volumes, and maximum instantaneous flows are projected by CBM operators in applications for groundwater appropriation permits. These values typically are somewhat overestimated to ensure that an adequate groundwater right is filed with the WSEO. Well completion reports document the actual flow when a well is completed. Monthly production reports filed with the WOGCC document water production over time during the life of a well.

The estimate of water production used in this analysis (CBM produced water) was compared to WOGCC production statistics for May 1999 that covered 902 producing CBM wells within the

Wyodak study area. Producing CBM wells averaged 12.4 gpm per well or produced water in May 1999. An earlier WOGCC analysis of 500 producing CBM wells showed an average water production per well of 14.6 gpm.

Even through water production may vary within the PRB and over time as wells continue production, it is necessary to take a hard look at cumulative groundwater withdrawals and cumulative surface water discharges. In order to analyze water volumes and water flows, these values must be estimated, even though they may be variable. The BLM has used the available data and its best professional judgement to make a representative estimate of water production for use in this NEPA analysis.

A specific mitigation plan or compensation plan for landowners is outside the authority of the BLM. The existing Water Well Agreement contained in Appendix D of the DEIS represents one such plan. It was developed by a working group of affected landowners and industry representatives (FEIS, p. 2-17).

Impoundments

Development of reservoirs on natural stream courses could severely impact native aquatic species and their habitats. Reservoirs should be sited in the uplands unless it can be shown that they will provide benefits to fish and wildlife resources.

Constructing larger (rather than smaller) ponds to retain produced water would provide more open water and a longer shoreline at one site. Larger ponds also may have the characteristics needed to support fisheries. Larger ponds may be more beneficial to wildlife.

Reservoirs or ponds created to retain the discharge of CBM produced water may create an attractive hazard to many species of birds and wildlife through the evaporative concentration of selenium. Water should not be stored in closed impoundments.

Response:

Impoundments on private land are considered and controlled by the surface owner, not the BLM. The BLM does recommend that water not be placed in playas or reservoirs that do not have properly designed flow-through structures. The BLM also recommends that main stem reservoirs not be used for water storage. WSEO authorizes surface water impoundments (reservoirs) based on engineering designs submitted by the applicant. Over 80 percent of the land area included in this analysis is privately owned. The impoundments on these lands are privately owned. The BLM has no authority relative to the future maintenance or reclamation of these structures.

Applicable Comment Letters (Wildlife/Fisheries):

1, 7, 8, 9a, 11, 15, 17, 18, 19, 25, 28, 33, 34, 40, 43, 44, 48

Land Use

Land Use Issue Statements and Responses:

U.S. Supreme Court Decision Regarding Coal Bed Methane Ownership

The recent U.S. Supreme Court decision regarding the ownership of coal bed methane rights should be included in the EIS.

Response:

The U.S. Supreme Court decision in Southern Ute Indian Tribe vs. Amoco Production Company, was issued after the DEIS was published. Under the current management situation that is analyzed in the DEIS, coal bed methane is managed by the federal government as an oil and gas right. The U.S. Supreme Court determined that coal bed methane is an oil and gas right, not a coal right. The decision does not require any change to the analysis documented in the DEIS. Impacts, mitigation, and monitoring related to development conflicts between separate plans to develop the coal estate and the oil and gas estate are addressed.

Fortification Creek Wilderness Study Area (WSA)

The anticipated impacts to the Fortification Creek Wilderness Study Area (WSA) should be adequately addressed. Analysis should include whether noise and activities on the edge of the Fortification Creek WSA diminish the area's wilderness potential. The BLM's management goals for preservation of this area must be met until a decision is made regarding its status as a wilderness area.

Response:

Noise and activities, including transportation corridors, already occur near the Fortification Creek WSA. BLM's policies mandate that the agency preserve the wilderness character of federal lands within this study area until a decision is made regarding its wilderness status. Indirect impacts to the WSA from CBM development activities will be limited for the following reasons. The WSA is not downstream of proposed CBM wells or discharge points. Oil and gas leases are not issued with surface occupancy rights (for drilling, access routes, or production facilities) within the WSA. Road access and pipeline routes would not cross federal lands within the WSA before a decision in made regarding the wilderness status of the WSA. Impacts to elk populations occurring in the vicinity of this WSA are described on page 4-89 of the DEIS. Impacts to this WSA will be analyzed site-specifically as APDs and PODs for federal CBM wells are reviewed by the BLM. A paragraph containing this clarification has been added to page 4-104.

"Wild Areas" and "Sense of Place"

An analysis of impacts to mixed public and private "wild areas" (unroaded areas containing 5,000 acres or more) should be included.

Public access, ranching and private recreation use (by outfitters) and "the sense of place" of the Wyodak area will change as a result of CBM development, and should be addressed in the EIS.

Response:

Public access, ranching, and recreation use by outfitters could change as a result of CBM development. Impacts to land uses will be analyzed site-specifically as APDs and plans of development for federal CBM wells are reviewed by the BLM. However, the BLM has no authority to manage private lands.

The "sense of place" of the Wyodak study area is a patchwork of private ranches interrupted by small parcels of public lands in a part of Wyoming where significant levels of mineral and energy resource development and production activities have been occurring for a long time. The low number of project workers anticipated for CBM production activities, and the low level of daily activity anticipated after drilling operations are concluded in an area, makes it unlikely that the "sense of place" in the Wyodak study area will change. Less than ten percent of the land area analyzed is federally owned and administered by the BLM.

Noise

Disturbance issues for wildlife species should include loss of habitat security due to noise and disturbance from humans/vehicles, not just ground breaking disturbance.

Noise impacts need further study.

Response:

The Wyodak CBM Project encompasses a patchwork of private ranches interrupted by small parcels of public lands in a part of Wyoming where significant levels of mineral and energy resource development and production activities have been occurring for a long time. The low number of CBM project workers and the low level of daily activity throughout the project life make it unlikely that noise and disturbance from humans/vehicles will change significantly. Under Alternative 1 less than 800 people would work over a 3,600 square mile area during the initial development period of 3 to 5 years. After the initial development period, less than 400 people would be employed during production and maintenance activities across 3,600 square miles. Less than 500 vehicles would be dispersed [illegible] 500 square miles during the initial development period. After the initial development period, an estimated 260 vehicles would support production and maintenance activities (DEIS, p. 4-108).

Noise from stationary compressors can be analyzed site-specifically, but the BLM has very limited authority, which is limited to the siting of compressors on federal leases. The authority for permitting stationary compressors, including control of emissions and noise, rests with the WDEQ. Under current Wyoming laws, the control of noise from stationary compressors would have to be implemented under municipal or county land use plans in order to limit the disturbance of nearby residents or wildlife populations.

Alternatives - Beneficial Use

The alternatives for beneficial use of the CBM produced water should be analyzed in the EIS before a decision is made regarding the disposal of CBM produced water.

Response:

WSEO authorizes the proposed appropriation of groundwater from a CBM well, the beneficial use(s) of the appropriated groundwater, and the specific locations of use identified by the applicants (landowner and CBM operator) in a groundwater appropriation permit (U.W.5). A coal bed methane well is recognized by the agency as a beneficial use of groundwater in Wyoming. Other beneficial uses, such as stock watering or irrigation, when applicable, also are listed on the permit application. The alternatives for beneficial use of the CBM produced water are not analyzed by the WSEO. The groundwater appropriation permit documents the nature and priority of groundwater rights filed in Wyoming.

The specific location where the appropriated groundwater is discharged onto the land surface and the effluent (water discharge) are authorized by WDEQ in an NPDES permit. Alternative locations for CBM produced water discharge points are not analyzed by WDEQ. The WDEQ's analysis focuses on requirements for effluent limitations and discharge monitoring that provide for continued safe use or consumption of Wyoming surface waters.

Surface use plans, including water discharge points, for federal wells are reviewed by the BLM (and/or FS). The analysis of plans for federal wells involving private surface ownership is a collaborative effort among the agency, the landowner, and the CBM operator. As conservator of the federal surface and mineral estate, the BLM retains responsibility for ensuring that the federal mineral resource is conserved (not wasted), and is developed in a safe and an environmentally sound manner. However, the BLM does not control the appropriation or use of groundwater.

Livestock Grazing - Rest Rotation Practices

Grazing management plans that rely upon turning water on and off in different areas to move or disperse livestock and manage the utilization levels of available forage could be affected by the continued availability of CBM produced water throughout the year.

Response:

Impacts from the "new" perennial flows of CBM produced water on grazing rest-rotation practices will be analyzed site-specifically as APDs and plans of development for federal CBM wells are reviewed by the BLM. The potential mitigation of removing livestock from an area or fencing out livestock likely would be the only feasible ways of preserving the objectives of rest-rotation grazing systems, where the water could no longer be turned on or turned off at will. Where federal surface is involved, water management plans (and plans for water disposal) would have to meet the provisions established in AMPs (allotment management plans) or the AMP would have to be revised.

Land Surface Impacts and Reclamation

Soil and vegetation loss and noxious weed invasions are significant impacts of CBM development and should be addressed adequately in the EIS.

Reclamation standards, requirements, and goals should be described in detail in the EIS. The future maintenance and reclamation of impoundment structures (dams) also should be addressed. Only native species should be used in revegetation mixes.

Response:

Soil and vegetation loss and noxious weed invasions will be analyzed site-specifically as APDs and plans of development for federal CBM wells are reviewed by the BLM.

Reclamation standards, requirements, and goals, including any requirements to utilize native species for revegetation, will be analyzed site-specifically as APDs and plans of development for federal CBM wells are reviewed by the BLM.

Land Use Conflicts

Conflicts between CBM development and other land uses should be addressed in the EIS. The BLM's decisions regarding CBM development on federal leases significantly affect private landowners. Other agency decisions regarding CBM development on fee and state leases also significantly affect private landowners.

Response:

Conflicts between CBM development and other land uses will be analyzed site-specifically as APDs and plans of development for federal CBM wells are reviewed by the BLM. The BLM's decisions regarding CBM development on federal leases do significantly affect private landowners. Other agency decisions regarding CBM development on fee and state leases also significantly affect private landowners. Landowners will be involved in (on-lease) decisions that affect their (off-lease) land. Water management plans are public documents and will be posted for public review upon receipt.

Stakeholder Involvement

Landowners should be involved in (on-lease) decisions that affect their (off-lease) land.

Response:

At the APD/POD level of analysis landowners are invited to onsite inspections for proposed activities involving their land (FEIS, p.1-14). BLM requires that CBM operators certify in their surface use plan that they have or will reach a surface use agreement with the surface landowner.

Water Management Plans

Water management plans containing site-specific information are essential to address impacts, use/storage, mitigation, and monitoring related to water resources. These plans should be limited to BLM jurisdictional lands, developed with public involvement, and included within the EIS.

Approval of any "hydrologic watershed analysis" would exceed the BLM's authority. The BLM does not have the authority to make approval of an APD dependent on the treatment of non-jurisdictional lands (off-site mitigation) in the water management plan.

Response:

As described in Appendix B, a water management plan is site-specific to a CBM Project Plan of Development (POD) for a small group of APDs, and is properly part of the APD/POD level of analysis, not this programmatic analysis for the Wyodak CBM Project (refer to FEIS, p. 1-14 and 1-15, Chapter 2, and Appendix B). A water management plan and the surface use plan it accompanies are public documents. BLM posts the non-confidential portions of APDs, (which would include surface use plans and water management plans), publicly for 30 days upon receipt. This information is available to agency decision makers and the public.

Water management plans are site-specific analysis tools that the BLM will use to address cumulative impacts of a CBM POD and reasonably connected actions within a watershed area. As conservator of the federal mineral estate (56 percent of the Wyodak study area), the BLM retains responsibility for ensuring that the federal mineral resource is conserved (not wasted), and is developed in a safe and environmentally sound manner. The BLM does not have jurisdiction over privately-owned surface lands.

Landowner Compensation

Improved discussion of compensation to potentially flooded landowners is needed.

Response:

Discussion of compensation to potentially flooded landowners is outside the scope of the EIS analysis. Landowner compensation is an issue that must be resolved between the CBM operators and the landowners. The BLM has no authority related to landowner compensation. There is no decision the agency could make.

Applicable Comment Letters (Land Use):

1, 12, 15, 17, 22, 25, 28, 34, 40, 44

CONSULTATION AND COORDINATION

The following agencies, groups, and companies have provided input to this EIS.

Federal Agencies

U.S. Forest Service
U.S. Geological Survey
U.S. Fish and Wildlife Service
National Park Service
U.S. Environmental Protection Agency
Department of the Army, Corps of Engineers
Bureau of Reclamation
Office of Surface Mining
Natural Resources Conservation Service

Tribes/Native American Representatives

Arapaho Tribal Council, Chairman
Northern Arapaho Business Council, Chairman
Mr. Francis Brown, Northern Arapaho Spiritual Leader
Mr. William C'Hair
Shoshone Tribal Council, Chairman
Shoshone Business Council, Mr. John Washakie
Mr. Haman Wise, Eastern Shoshone Spiritual Leader
Mr. John Tarnesse, Shoshone Spiritual Leader
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Crow Tribal Council, Mr. John Hill, Sr.
Crow Tribal Administration, Chmn. Clara Nomee
Cheyenne River Sioux Tribal Council, Chairman
Crow Creek Sioux Tribal Council, Chairman
Flandreau Santee Sioux Executive Committee, President
Santee Sioux Tribal Council, Chairman
Mr. Clifford Long Sioux
Mr. Steven Brady
Northern Cheyenne Tribal Council, Mr. William Walks Along
Northern Cheyenne Cultural Committee, Ms. Adeline Whitewolf
Sant'Angelo & Trope, Mr. Jack F. Trope

State of Wyoming

Wyoming Department of Administration and Information
Wyoming Department of Agriculture
Wyoming Department of Environmental Quality
Wyoming Game and Fish Department
Wyoming Geological Survey
Wyoming Office of Federal Land Policy
Wyoming Office of State Lands and Investments
Wyoming Oil and Gas Conservation Commission
Wyoming Public Service Commission
Wyoming State Engineer's Office
Wyoming State Historic Preservation Office
Wyoming Water Development Commission

Citizens' Groups and Regional Societies

Powder River Basin Resource Council
Inyan Kara Grazing Association
Wyoming Independent Producers Association
National Mining Association

Companies

Torch Operating Company
Devon Energy Corporation
M. John Kennedy
Barrett Resources Corporation
Redstone Resources, Inc.
Western Gas Resources, Inc.
Lance Oil & Gas Company, Inc.
Yates Petroleum
Rim Operating
Pennaco Energy Inc.
North American Resources

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CHAPTER 7
ACRONYMS

ac-ft	Acre-feet (1 acre-foot = 329,829 gallons)
ac-ft/yr	Acre-feet per year
APD	Application for permit to drill
AQD	Air Quality Division, Wyoming Department of Environmental Quality
ASSMR	American Society of Surface Mining and Reclamation
AUM	Animal unit month
BACT	Best Available Control Technology
bbl	Barrel (42 gallons)
bpd	Barrels per day
bcf	Billion cubic feet
BEA	Bureau of Economic Analysis
BFO	Buffalo Field Office, Bureau of Land Management
BLM	Bureau of Land Management, U.S. Department of the Interior
CBM	Coal bed methane
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations. Numbers refer to title and part; that is, 40 CFR 1500 refers to title 40, part 1500.
cfs	Cubic feet per second (equivalent to 448.83 gallons per minute)
CO	Carbon Monoxide
COE	U.S. Army Corps of Engineers
COI	Circle of influence of a CBM production well

CHIA	"Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming"
CCEDC	Campbell County Economic Development Corporation
dBA	A-weighted scale, decibels
DOE	U.S. Department of Energy
EA	Environmental assessment
EC	Electrical conductivity, measured in μmhos/cm
EIS	Environmental impact statement
EPA	U.S. Environmental Protection Agency
ESP	Exchangeable sodium percentage
Fm	Formation (geologic)
FS	U.S. Forest Service, U.S. Department of Agriculture
gm/hp-hr	Grams per horsepower-hour
gpm	Gallons per minute (equivalent to 0.002 cfs, approximately)
GAGMO	Gillette Area Groundwater Monitoring Organization (coal operators)
HAP	Hazardous Air Pollutants
HP	Horsepower
km	Kilometer
LBA	Lease by application
LQD	Land Quality Division, Wyoming Department of Environmental Quality
LRMP	Land and Resource Management Plan
mcf	Thousand cubic feet
MCFD	One thousand cubic feet per day

mg/l	**Milligrams per liter (1 mg = 1 ppm [part per million]; 1 liter = 0.264 gallons)**
mgd	**Million gallons per day**
µg/l	**Micrograms per liter (1 µg = one thousandth of a milligram or 0.001 mg or 1ppb [part per billion])**
µg/m³	**Micrograms per cubic meter (1 cubic meter = 1.308 cubic yards)**
mmcf	**Million cubic feet**
mmhos/cm	**Soluble salts (salinity) in a soil expressed in millimhos per centimeter**
MMCFD	**One million cubic feet per day**
MT	**Montana**
NAAQS	**National Ambient Air Quality standards**
NAS	**National Academy of Sciences**
NEPA	**National Environmental Policy Act of 1969**
NO_x	**Nitrogen Oxides**
NO_2	**Nitrogen Dioxide**
NOAA	**National Oceanic and Atmospheric Administration**
NOI	**Notice of Intent (to prepare an EIS)**
NPDES	**National Pollution Discharge Elimination System**
NPS	**National Park Service, U.S. Department of Interior**
NRHP	**National Register of Historic Places**
NRCS	**Natural Resources Conservation Service**
OSM	**Office of Surface Mining, Reclamation and Enforcement**
PAP	**Permit application packages**
pci/l	**Picocurie per liter, used to measure Radium 226**

pH	**Acidity, measured in standard units**
PM_{10}	**Particulate matter less than 10 micrometers (respirable)**
PRAGMO	**Powder River Area Groundwater Monitoring Organization**
PRB	**Powder River Basin**
psi	**Pounds per square inch**
PVC	**Plastic (polyvinyl chloride-type, used in plastic pipes and well casings)**
R_W	**Range number West, an east-west rectangular land survey area coordinate**
RMP	**Resource Management Plan**
ROD	**Record of Decision**
S__	**Section number, a rectangular land survey area**
SAR	**Sodium Absorption Ratio**
SCS	**Soil Conservation Service, U.S. Department of Agriculture**
SHPO	**State Historic Preservation Officer**
SMCRA	**Surface Mining Control and Reclamation Act of 1977**
SO_2	**Sulfur dioxide**
Sq mi	**Square miles**
STATSGO	**State Soil Geographic Database**
T_N	**Township number North, a north-south rectangular land survey area coordinate**
TBNG	**Thunder Basin National Grassland**
TDS	**Total dissolved solids**
TPH	**Total petroleum hydrocarbons**
TSP	**Total suspended particulates**
TSS	**Total suspended sediments**

µmhos/cm	Micromhos per centimeter {thousandths of unit of specific conductance) (a measure of electrical conductivity)
USDA	U.S. Department of Agriculture
USDC	U.S. Department of Commerce
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service, U.S. Department of the Interior
USGS	Geological Survey, United States Department of the Interior
VOCs	Volatile Organic Compounds
VOR	VHF (very high frequency) Omnidirectional Range (radio aid used for navigation)
VQO	Visual Quality Objective
VRM	Visual resource management
WDEQ	Wyoming Department of Environmental Quality
WDR	Wyoming Department of Revenue
WGA	Wyoming Geological Association
WGFD	Wyoming Game and Fish Department
WGS	Wyoming Geological Survey
WOGCC	Wyoming Oil and Gas Conservation Commission
WQD	Water Quality Division, Wyoming Department of Environmental Quality
WSA	Wilderness Study Area
WSEO	Wyoming State Engineer's Office
WWRC	Wyoming Water Resources Center
WY	Wyoming

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APPENDIX B
STANDARD "CONDITIONS OF APPROVAL" FOR APDs

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STANDARD "CONDITIONS OF APPROVAL" FOR APDS

BLM - Buffalo Field Office

Mitigating measures (i.e., stipulations), in the form of "Conditions of Approval", are applied to both APD and Sundry Notice Drilling Plans & Surface Use Plans when: 1) they are not specifically addressed in those plans, and; 2)they are needed to mitigate impacts to resource values identified at the onsite inspection or during review of the plans. The first section identifies standard mitigating measures applicable to development involving only coal bed methane. The second section identifies standard mitigating measures that are pertinent to all federal oil & gas lease development. Not all of the mitigating measures in this second section are applicable to coal bed methane development.

It is important to note that site-specific stipulations also are developed by the BLM authorized officer, as needed, on a case-by-case basis at the onsite inspection to address special, unanticipated issues not addressed by a standard mitigating measure (e.g., erosive soils, steep slopes, special wildlife habitats or other special wildlife mitigation measures, proximity to existing improvements, etc.) These special mitigating measures obviously cannot be listed here. The following are the standard mitigating measures that are always applied (if not already specifically addressed in the plans).

Section 1 - APPLICABLE TO COAL BED METHANE WELL DEVELOPMENT ONLY

1. **The operator is committed to all mitigation measures and monitoring contained in the (Depends on area) EA/EIS.**

2. **The lessee/operator shall provide a comprehensive *water management plan* as part of the Project Plan of Development that addresses how produced water will be handled during the testing and production of well(s). Adequate information should be available to develop this plan before wells are drilled.**

   For exploratory wells in areas of unknown, untested production potential, the operator will need a temporary (drilling and testing) water management plan. If the well(s) prove to be productive, the operator will then need to submit a permanent water management plan via a Sundry Notice for BLM approval prior to producing the well(s).

   Requirements for temporary and permanent water management plans are listed separately below:

Temporary Water Management Plan

Items to be addressed in the Temporary Water Management plan include the following:

- Must include a USGS topographic map (1:24000) (or legible copy) showing the actual discharge points, well locations, access routes, and surface pipeline routes.
- Temporary discharge points must be not be located on hill tops or upland areas. They must be located in existing low-gradient channels (below any active or potentially active head cuts). Or, water can be discharged to existing impoundments of adequate size to store all the test water or designed to pass the discharge water (outlet pipes or reinforced spillways).
- Water energy dissipation measures must be designed and utilized at discharge points and along any unstable downstream sections (minor head cuts, eroding channel sections, etc.).
- Only surface piping will be authorized for temporary discharge, no trenching will be allowed.
- Temporary discharge will be allowed only until the wells have been properly tested to prove production.
- Prior to any discharge of water, a standard water quality analysis (barium, iron, manganese, radium-226, chlorides, sulfates, pH, TDS, TPH, and any other parameters, as required by WDEQ) from each well or from representative wells (completed in each zone of production) must be submitted to BLM.
- Prior to any discharge of water, all applicable permits and authorizations (such as WDEQ, WSEO, or COE) must be obtained.

Permanent Water Management Plan

Items to be addressed in the Permanent Water Management plan include the following:

- Must include a USGS topographic map (1:24000) (or legible copy) showing location of the actual discharge points, wells, access routes, pipeline routes, erosion control and stabilization measures, and impoundments (reservoirs).
- Discharge points must be not be located on hill tops or upland areas. They must be located in existing low-gradient channels (below any active or potentially active head cuts). Cumulative discharge must not exceed the naturally occurring, mean annual peak flow of the receiving channel. Water can be discharged to existing impoundments that are designed (outlet pipes or reinforced spillways) to pass the proposed discharge water, the naturally occurring mean annual flow, and any existing discharge water.

- Plan for, and design of, erosion control and stabilization measures must be shown. Any in-channel measures must be designed to accommodate existing and proposed discharges in addition to naturally occurring flow.

- Any new impoundments or enhancement of existing structures must be properly permitted with the WSEO and/or the COE and designed with outlet works to pass all "existing, planned, and potential discharge water" in addition to naturally occurring mean annual flow. In addition, the combination of flood storage (the volume of storage above the outlet works and below the spillway) and spillway capacity must be adequate to accommodate a specific design flood as required by the WSEO. The required design depends on the size of the impoundment (25-year, 6-hour storm event, or 100 year, 24-hour storm event). Flood storage alone must be adequate to contain lesser events. If passage of water through the spillway is to be frequent, the spillway must be reinforced and designed for continual flow (no regular flows on earthen spillways). The outlet works must also be designed in such a manner as not to affect any existing downstream water rights.

  - The "existing, planned and potential discharge water" can be roughly calculated by determining the watershed area, dividing by the minimum well spacing (currently 40 acres), and multiplying this by the average discharge rate. As is obvious, it is undesirable to put impoundments on the main stem of a large drainage.

- Water production rates (for each discharge point) must be disclosed including discharge schedule (initial, intermediate, and final rates and duration) and maximum, mean, and minimum anticipated rates.

- A standard water quality analysis (barium, iron, manganese, radium-226, chlorides, sulfates, pH, TDS, TPH, and any other parameters, as required by WDEQ) from each well or from representative wells (completed in each zone of production) must be submitted to BLM.

- Prior to any discharge of water all applicable permits and authorizations (such as WDEQ, WSEO, or COE) must be obtained.

- A hydrologic watershed analysis, based on field reconnaissance, must be done that includes the following:

  - Watershed area
  - Average watershed slope
  - Existing channel (average slope, width, depth, condition, etc.)
  - Calculation of mean annual runoff
  - Peak flow analysis (annual, 10, and 25 year return interval at a minimum)
  - Destination (i.e. tributary to the Belle Fourche River)

- **Description of the existing watershed including:**
  - **Existing wells (location, depth, water level, use, condition)**
  - **Existing impoundments (location, size, volume, use, condition, description of outlet works and spillway)**
  - **Road crossings (crossing type - culvert size, low water crossing, bridge, etc. and condition)**
  - **Water related uses (i.e. flood irrigated/sub- irrigated crops, livestock, etc.)**
  - **Potential downstream concerns (i.e. channel impoundments, hay meadows, coal mine reclamation or sediment structures, unimproved channel crossings, etc.) and plans to mitigate impacts.**

- **Monitoring Plans, which must include as a minimum:**
  - **Discharge point(s)- will be monitored on a monthly basis during the first year of operation. Inspectors will note the condition of each discharge point, check for evidence of erosion, and schedule any remedial work if required.**
  - **Dam outlets (spillways and pipes) & culvert outlets- will be checked quarterly, or after major storm events during the first year of operation. Inspectors will note the condition of the discharge point, check for evidence of erosion, and schedule any remedial work if required.**
  - **Erosion stabilization measures (headcuts, etc.)- will be inspected for signs of erosion or structure failure. Inspectors will note condition and schedule any remedial work if required.**
  - **Downstream channel (below the well(s)/project)- will be inspected for signs of accelerated erosion due to the continuous flow of produced water.**
  - **After the first year of operation, inspections will only occur annually, unless specific sites have required remedial action. Inspections also will monitor stream channel crossings, culverts, low water crossings, bridges, etc. within and below the project.**

If information is not known and cannot be accurately presented, the permanent water management plan needs to be submitted in a subsequent Sundry Notice once the productive capability of the well has been determined.

3. **The operator shall submit a Sundry Notice for approval prior to construction of new surface disturbing activities on lease (e.g., gas & water pipelines, power lines, metering house, access roads and other facilities).**

4. **The road will be maintained in an undisturbed, 2-track status, as long as year-round, environmentally-sound access can be achieved. The operator shall be responsible for limiting access of field personnel to times when rutting and other resource impacts don't occur. The operator will be responsible for performing any remediation and/or necessary road upgrading (e.g., elevating, surfacing, culverts, low-water crossings, water-wings, etc.) as directed by the BLM authorized officer, resulting from untimely access. In this case, the operator may**

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be required to conduct a Class III Cultural Inventory, if not already done, on upgrade areas prior to work being performed.

5. **After drilling and construction of production facilities, and at time of final abandonment, all disturbed areas (including pipelines and access roads) will be drill seeded with the seed mixture shown below, unless a different seed mix is provided by the surface owner. Rates given are in pounds of Pure Live Seed (PLS) per Acre. The operator will provide copies of the seed tags to the authorized officer, if requested.**

Species-Cultivar	**lbs PLS/Acre**
(determined at the site-specific onsite inspection)	

6. **If in the process of air drilling a well there is a need to utilize mud, all circulating fluids will be contained either in a small temporary mud pit or in an above-ground containment tank. The pit or containment tank will be of a large enough capacity to safely contain all expected fluids without danger of overflow. Fluids and cuttings will not be squeezed out of the pit, and the pit will be reclaimed in an expedient manner per the above requirements.**

7. **Vegetation control by mowing or cutting is authorized on the access road and around the well and production facilities to minimize fire hazard and allow safe, environmentally-sound, year-round access. No vegetation or soil blading is authorized.**

8. **CBM well APDs will not be approved unless the operator provides certification that a water well agreement has been offered as explained in number (12) of the Surface Use Plan.**

9. **An APD is not considered complete until a Class III cultural resource survey has been performed and a report is submitted to BLM. BLM's consultation with the State Historic Preservation Office is mandatory and can take up to 30 days.**

Section 2 - PERTINENT TO ALL OIL & GAS WELL DEVELOPMENT

Note: Not all of the mitigating measures in this section are applicable to coal bed methane development.

DURING CONSTRUCTION

1. **Remove all available topsoil (estimated average depth of _____ inches, determined site-specifically during the onsite inspection) from the location, including areas of cut, fill, and/or spoil storage areas, and stockpile at the site. Clearly segregate topsoil from excess spoil material. Any topsoil stockpiled for one year or longer will be signed and stabilized with vegetation. Seed with annual ryegrass or other suitable cover crop.**

2. **The operator will not push soil material and overburden over side slopes or into drainages. All soil material disturbed will be placed in an area where it can be retrieved and where it doesn't impede watershed and drainage flows.**

3. **Construct the backslope no steeper than 1.5:1. Construct the foreslope no steeper than 2:1.**

4. **Maintain a minimum 20' undisturbed vegetative border between the toe of fill of pad and/or pit areas and the edge of adjacent drainages.**

5. **Prior to beginning construction or drilling operations, the operator shall upgrade the proposed access road to BLM standards (including topsoiling, crowning, ditching, drainage culverts, surfacing, etc.) to ensure safe, environmentally-sound, year-round access.**

6. **A flare pit will be constructed on the well pad for use during drilling operations. It will be located at least 125-feet from the well head and will be located down-wind from the prevailing winds.**

7. **The reserve pit will be oriented to prevent collection of surface runoff. After the drilling rig is removed, the operator may need to construct a trench on the uphill side of the reserve pit to divert surface drainage around it. If constructed, the trench will be left intact until the pit is closed.**

8. **The reserve pit will be lined with an impermeable liner if permeable subsurface material is encountered. An impermeable liner is any liner having a permeability less than 10^{-7} cm/sec. The liner will be installed so that it will not leak and will be chemically compatible with all substances which may be put in the pit. Liners made of any man-made synthetic material will be of sufficient strength and thickness to withstand normal installation and pit use.**

9. **If any cultural values (sites, artifacts, remains) are observed during operation of this lease/permit/right-of-way, they will be left intact and the Buffalo Field Manager notified. The authorized officer will conduct an evaluation of the cultural values to establish appropriate mitigation, salvage or treatment.**

10. **If paleontological resources, either large and conspicuous, and/or a significant scientific value are discovered during construction, the find will be reported to the authorized officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM-approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) needed to prevent the potential loss of any significant paleontological values. Operations within 250 feet of such a discovery will not be resumed until written authorization to proceed is issued by the authorized officer. The applicant will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operation.**

DURING OPERATIONS

1. **Confine all equipment and vehicles to the access road, pad, and area specified in the APD.**

2. **All trash will be contained in a trash cage. Upon completion of the drilling operation, the**

trash cage will be removed and the trash disposed of at an authorized disposal site. No trash or empty barrels will be placed in the reserve pit or buried on location.

3. Fence the reserve pit on three (3) sides during drilling and on the fourth side at the time the rig is removed.

4. Sewage shall be placed in a self-contained, chemically treated porta-potty on location.

5. Rat and mouse holes shall be filled and compacted, from the bottom to the top, immediately upon release of the drilling rig from the location.

6. Produced hydrocarbons shall be put in test tanks on location during completion work. Produced water will be put in the reserve pit during completion work, per Onshore Order #7.

7. Cuttings and drilling fluids shall be put in the reserve pit during drilling.

8. The operator and their contractors shall ensure that all use, production, storage, transport and disposal of hazardous and extremely hazardous materials associated with the drilling, completion and production of this well will be in accordance with all applicable existing or hereafter promulgated federal, state and local government rules, regulations and guidelines. All project-related activities involving hazardous materials will be conducted in a manner that minimizes potential environmental impacts. A file will be maintained containing current Material Safety Data Sheets (MSDS) for all chemicals, compounds and/or substances which are used in the course of construction, drilling, completion and production operations.

9. The only fluids/waste materials which are authorized to go into the reserve pit are RCRA-exempt oil and gas exploration and production wastes. Any evidence of non-exempt wastes being put into the reserve pit may result in the BLM authorized officer requiring specific testing and closure requirements.

   RCRA-exempt oil and gas exploration and production wastes include:

   - drilling muds & cuttings
   - rigwash
   - excess cement and certain completion or stimulation fluids defined by EPA as exempt

   It does not include drilling rig waste, such as:

   - spent hydraulic fluids
   - used engine oil
   - used oil filter
   - empty cement, drilling mud, or other product sacks
   - empty paint, pipe dope, chemical or other product containers
   - excess chemicals or chemical rinsate

IF THE WELL IS A DRY HOLE

1. During reclamation of the site, the operator will push fill material back into the cuts and up over the backslope to approximate the original topography. No depressions will be left that trap water or form ponds.

2. The fluids and mud must be dry in the reserve pit before the pit area is recontoured. The operator will be responsible for recontouring any subsidence areas that develop as a result of closing a pit before it is completely dry. The plastic pit liner will be cut off below grade and properly disposed of before beginning to recontour the site.

3. Before the location has been reshaped and prior to redistributing the topsoil, the operator will rip or scarify the drilling platform and access road, on the contour, to a depth of at least 12 inches. The rippers are to be no farther than 24 inches apart.

4. Distribute the topsoil evenly over the entire location and prepare the seedbed by discing to a depth of 4-to-6 inches, following the contour.

5. Water bars are to be constructed at least one (1) foot deep, on the contour, with approximately two (2) feet of drop per 100 feet of water bar, to ensure drainage. Water bars are to be extended into established vegetation. All water bars are to be constructed with the berm on the downhill side of the water bar, to prevent soft material from silting in the trench. The initial water bars should be constructed at the top of the backslope. Subsequent water bars should follow the following general spacing guidelines:

% Slope	Spacing Interval (feet)
2 or <	200
2 - 4	100
4 - 5	75
5 or >	50

6. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed and prevent soil and seed losses. To maintain quality and purity, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. When a different seed mix desired by the surface owner is not provided, use the following:

Species-Cultivar	lbs PLS/Acre
(determined at the site-specific onsite inspection)	

7. If slopes too steep for machinery to operate, twice the specified amount of seed may be broadcast and raked by hand.

8. Complete fall seeding after September 15 and prior to ground frost. To be effective, complete spring seeding after the frost has left the ground and prior to May 15.

9. The operator will control noxious weeds on the location and along the access road. On BLM-administered surface, this will require authorization in a pesticide use permit.

10. The operator will reshape abandoned access roads by pushing fill material back into the cuts. On roads to be permanently closed, water bars shall be constructed near the contour across the shaped road, utilizing the spacing guidelines contained in No. 5 above.

11. Disc and seed the access road as per No. 6 above.

12. All rehabilitation work, including seeding, will be completed as soon as feasible following plugging.

13. Following seeding, the location will be temporarily fenced off (if not already fenced) for at least two complete growing seasons, to ensure long-term reclamation success, unless otherwise requested by the surface owner.

14. BLM will not release the performance bond until the area has been successfully revegetated (evaluation will be made after the second growing season) and has met all other reclamation goals of the surface owner and surface management agency.

15. A Notice of Intent to Abandon and a Subsequent Report of Abandonment must be submitted for abandonment approval.

IF THE WELL IS A PRODUCER

1. The entire location will be fenced off with a 4-strand barbed wire fence, containing H-braces on the corners and a cattleguard, located far enough outside disturbed areas and soil stockpiles to allow for perimeter rehabilitation within the fenced location, unless otherwise requested by the surface owner.

2. Landscape those areas not required for production to the surrounding topography as soon as possible. The fluids and mud must be dry in the reserve pit before recontouring the pit area. The operator will be responsible for recontouring any subsidence areas that develop as a result of closing a pit before it is completely dry.

3. Reduce the backslope to 2½:1 and the foreslope to 3:1. Reduce slopes by pulling fill material up from foreslope into the base of cut slopes.

4. Production facilities (including dikes) must be placed on the cut portion of the location and a minimum of 15 feet from the base of the back cut.

5. A dike will be constructed completely around the production facilities (i.e. production tanks, water tanks, and heater-treater). The dikes for the production facilities must be constructed of impermeable soil, able to hold the capacity of the largest tank plus 2-feet of freeboard, and be independent of the back cut.

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6. Any chemicals used in treating the wells (e.g., corrosion inhibitor, emulsion breaker, etc.) will be held in a secure, fenced-in area that has a secondary containment structure (dikes, catchment pan, etc.)

7. The load-out line coming from the oil/condensate tank(s) will have a suitable containment structure to capture and recycle any oil spillage that might occur.

8. Individual production facilities (tanks, treaters, etc.) will be fenced-off (if entire facility not already fenced-off).

9. Distribute conserved topsoil (from stockpile) evenly over those areas not required for production and seed as recommended. **Due to fragile soils, the entire well location may need to be fenced-off to ensure revegetation success and the stability of the reclaimed location perimeter throughout the producing life of the well, subject to the discretion of the BLM authorized officer.**

10. All permanent above-the-ground structures, tank batteries, etc., that will remain longer than six months will be painted desert brown (Munsell standard color No.____________, to be determined at onsite). An exception will be made where special safety colors are required under Wyoming Occupation Health and Safety Act Rules and Regulations.

11. Upgrade and maintain access roads and drainage control (e.g., culverts, drainage dips, ditching, crowning, surfacing, etc.), as necessary, and as directed by the BLM authorized officer, to prevent soil erosion and accommodate safe, year-round traffic.

12. Prior to construction of production facilities not specifically addressed in the APD, the operator shall submit a Sundry Notice to the BLM authorized officer for approval.

13. If not already required prior to constructing and drilling the well location, the operator shall immediately upgrade the entire access road to BLM standards (including topsoiling, crowning, ditching, drainage culverts, surfacing, etc.) to ensure safe, environmentally-sound, year-round access.

PIPELINES AND FLOWLINES

1. Prior to construction, any pipelines/flowlines located off the disturbed well pad must be authorized by the BLM under a Sundry Notice.

2. Graders shall be used whenever possible to construct or to clear the pipeline right-of-way. The cleared right-of-way shall not be more than fifteen (15) feet wide (preferably three (3) feet wide on the soil stockpile side, and twelve (12) feet wide on the working side of the trench) without prior approval of the authorized officer. Bladed materials shall be placed back into the cleared route once construction is completed.

3. Pipeline construction shall not block nor change the natural course of any drainage. Suspended pipelines shall provide adequate clearance for maximum runoff.

4. Pipeline trenches shall be compacted during backfilling. Pipeline trenches shall be maintained in order to correct settlement and erosion.

5. Water bars are to be constructed at least one (1) foot deep, on the contour, with approximately two (2) feet of drop per 100 feet of water bar, to ensure drainage. Water bars are to be extended into established vegetation. All water bars are to be constructed with the berm on the downhill side of the water bar, to prevent soft material from silting in the trench. The initial water bars should be constructed at the top of the backslope.

   Subsequent water bars should follow the following general spacing guidelines:

% Slope	Spacing Interval (feet)
2 or <	200
2 - 4	100
4 - 5	75
5 or >	50

6. All disturbed areas associated with well drilling and associated facilities (pipelines, access roads, etc.) will be seeded during the first fall following construction. The operator will drill seed on the contour to a depth of 0.5 inch, followed by cultipaction to compact the seedbed, and prevent soil and seed losses. To maintain quality and purity, certified seed with a minimum germination rate of 80% and a minimum purity of 90% will be used. When a different seed mix desired by the landowner is not provided, use the following:

Species-Cultivar	lbs PLS/Acre
(determined at the site-specific onsite inspection)	

7. If slopes are too steep for machinery to operate, twice the specified amount of seed may be broadcast and raked by hand.

8. Complete fall seeding after September 15 and prior to ground frost. To be effective, complete spring seeding after the frost has left the ground and prior to May 15.

9. The operator will be responsible for control of noxious weeds along the pipeline right-of-way. On BLM-administered surface, this will require an authorized pesticide use permit prior to spraying of any commercial herbicides.

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APPENDIX E
DEIS COMMENT LETTERS

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Name	City, State	Received
1. Prairie Springs Ranch	Gillette, WY	6-15-99
2. CMS Energy Oil & Gas	Houston, TX	6-15-99
3. Holland & Hart	Jackson, WY	6-15-99
4. National Mining Association	Washington, DC	6-15-99
5. COGEMA Resources, Inc.	Mills, WY	6-15-99
6. Department of the Army	Omaha, NE	6-21-99
7. Kathy Moriarty	E-Mail	6-22-99
8. Gerald Kresge	E-Mail	6-22-99
9. Office of Federal Land Policy	Cheyenne, WY	6-22-99
9a. Wyoming Game & Fish Department	Cheyenne, WY	6-22-99
9b. Wyoming State Geological Survey	Laramie, WY	6-22-99
9c. Wyoming State Engineers Office	Cheyenne, WY	6-22-99
10. Anonymous	E-Mail	6-23-99
11. Scott Phinney	E-Mail	6-23-99
12. Scientific Geochemical Services	Casper, WY	6-24-99
13. Anonymous	E-Mail	6-24-99
14. Devon Energy Corporation	Oklahoma City, OK	6-25-99
15. Neil O. and Jennifer S. Miller	E-Mail	6-28-99
16. E. Barlow	E-Mail	6-28-99
17. Wildlife Management Institute	Fort Collins, CO	6-28-99
18. U.S. Fish & Wildlife Service	Cheyenne, WY	6-28-99
19. Pam Christensen	Sheridan, WY	6-29-99
20. Office of Federal Land Policy	Cheyenne, WY	6-30-99
20a. Department of Environmental Quality	Cheyenne, WY	6-30-99
21. Gary and Louise Kay	Gillette, WY	7-1-99
22. Peter J. Dube	Buffalo, WY	7-1-99
23. City of Gillette	Gillette, WY	7-2-99
24. US Bureau of Reclamation	Rapid City, SD	7-2-99
25. Kris Korfanta	E-Mail	7-6-99
26. Gillette Area Groundwater Monitoring Organization	Gillette, WY	7-7-99
27. Gene R. George & Associates, Inc.	Casper, WY	7-9-99
28. Mark Winland (WY Wildlife Federation)	Cheyenne, WY	7-13-99
29. True Oil Company	Casper, WY	7-13-99
30. Enron Oil & Gas Company	Denver, CO	7-13-99
31. Thunder Basin Coal Company	Wright, WY	7-13-99
32. Richard L. Innes	Casper, WY	7-14-99
33. Tom Bell	Lander, WY	7-14-99
34. Powder River Basin Resource Council	Sheridan, WY	7-14-99
35. Prima Oil & Gas Company	Denver, CO	7-14-99
36. Petroleum Association of Wyoming	Casper, WY	7-14-99
37. Kennecott Energy	Gillette, WY	7-14-99

Name	City, State	Received
38. Triton Coal Company	Gillette, WY	7-14-99
39. Wyoming Mining Association	Cheyenne, WY	7-14-99
40. Nancy Hilding	Black Hawk, SD	7-14-99
41. Office of Federal Land Policy	Cheyenne, WY	7-15-99
41a. Department of Environmental Quality	Cheyenne, WY	7-15-99
41b. Richard Chancellor (LQD)	Cheyenne, WY	7-15-99
42. Barlow Livestock	Gillette, WY	7-16-99
43. Biodiversity Associates	Laramie, WY	7-16-99
44. Wyoming Outdoor Council	Lander, WY	7-16-99
45. Lance Oil & Gas Company	Denver, CO	7-16-99
46. Rio Algom Mining Corporation	Oklahoma City, OK	7-19-99
47. Department of Environmental and Natural Resources	Pierre, SD	7-19-99
48. US Fish & Wildlife Service	Cheyenne, WY	7-19-99
49. Barrett Resources Corporation	Gillette, WY	7-20-99
50. US Forest Service	Lakewood, CO	7-22-99
51. US Environmental Protection Agency	Denver, CO	7-22-99
52. National Park Service	Denver, CO	7-22-99

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Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort St.
Buffalo, WY 82834

BUREAU OF LAND MANAGEMENT
JUL 15 [illegible]
BUFFALO [illegible]

Dear Mr. Zander

Under the NEPA law, the BLM has to present a plan for mitigation of impacts, the plan has to be published in the EIS, and it has to be available for public comment. Furthermore, under NEPA the material in the EIS has to be presented in a way that is clear, concise, and easily understood. Throughout this Draft EIS document I find the lack of a plan for mitigation of impacts, and some data is erroneous, some is misleading, and some is fragmented and hard to locate. Mitigation plans are deferred for review in APD's and Sundry Notices, which are not included in this EIS and are not subject to public comment as required by NEPA.

PAGE

SOCIOECONOMICS (JOBS)

3-35
4-121
4-3

Socioeconomics is a big word for whether or not you will have a job in the future as a result of this project. According to Wyoming Department of Employment, the largest group of workers in Campbell County are the 4,257 miners. The coalbed methane project is expected to provide at most 384 long term jobs over the life of the project. According to this EIS, CBM wells located in areas where future mining may take place will take precedence over coal mining as long as gas is being produced. This will impede future growth in the coal industry, and will cause an economic hardship to the largest industry in Campbell County. This hardship could last for 15 years or more, and we could lose the 4,257 coal mining jobs which are the backbone of our economy. At best, the coal industry will have to pay exorbitant amounts to the Coalbed Methane industry in some areas as the cost of staying in business. All this during one of the toughest coal markets in years.

Mitigation measures for the far reaching economic consequences of this project are omitted from the EIS. Furthermore, this information is fragmented in the EIS document, making the information hard to find. Both are violations of the NEPA law.

AIR POLLUTION

4-71 Air Pollution: Compressors which burn methane gas as their power source have been found to emit formaldehyde, a known carcinogen. This is a potential threat to public safety. The BLM did not publish the results of its research on formaldehyde emissions from this project in this EIS. However, the reported emission rate of 0.45 gm/hp-hr (105 tons per year of formaldehyde) is significant, and is considered a major source of pollution under the Clean Air Act. Anything more than 10 tons per year is considered a major source of air pollution. Furthermore, the pollution will be scattered over a large area and will impact a large portion of the population. At the target of 0.077 micrograms per square meter, one person in one million gets cancer from the formaldehyde. As a result, BLM recommends that compressor stations be sited 10 kilometers (about 6 miles) from a residence. The proposed action includes 145 booster stations and 43 field stations for a total of 188 compressor stations.

2-4 Proposed Alternatives: The proposed alternative is for 5000 wells in the Powder Basin. According to this EIS, 900 wells exist and 3000 were permitted as of 12-31-98. Industry figures put permitted wells at 5000 at this writing. Therefore we have already reached the cap for CBM development under the proposed alternative, and exceeded the cap for CBM development under the "no action" alternative. The "no action" plan should not include any CBM wells in order to establish an accurate baseline for the study area. To accurately address cumulative impacts from the project, the industry goal of 15,000 wells must be used. Anything less does not accurately depict the cumulative impacts from this project.

3-40
3-45
4-13
4-67
Endangered and sensitive species: Special Status species in the study area are Bald Eagle, Black-footed Ferret, Peregrine Falcon, Swift Fox, Mountain Plover, Sturgeon Chub, Ute Ladies Tresses; 27 additional species are listed as sensitive. Analysis is reported to have been done by a "fly over," this is not enough detail to analyze impacts to the species listed. The Powder River in Wyoming supports the largest known reproducing population of Sturgeon Chub. Eight tributaries to the the Powder River comprise one third of the study area, however the impacts to the Sturgeon Chub are dismissed. The wells in these drainages will pump much more water than existing development on the eastern edge of the project. Industry estimates are over 20gpm per well, which will cause much greater and more regular flows in the Powder River. Changes in pH are critical to fish and aquatic life, as are changes in TDS and salts. Since the water quality is variable, specific analysis must be done and included in this EIS in order to accurately assess impacts to fish and aquatic life, including the Sturgeon Chub. Field scientific study, using the facts about the water discharges and other ecosystem changes on the Powder River, needs to be done to accurately assess impacts to these species. Specific mitigation plans for these species are not included in the EIS, a violation of the NEPA law.

4-2 Geologic Hazards: Geologic hazards, including methane and hydrogen sulfide gas seeps, underground coal fires, explosive levels of methane in domestic water wells, and the contamination of homes has occurred in areas of coal mining and areas of methane development in Wyoming, as well as in other states. Wyoming State officials have refused to do baseline testing for methane gas in water wells and homes. Baseline testing by private citizens of Campbell County is being done, and has revealed indicators for geological catastrophe. Area water wells have been found to contain an increasing concentration of methane gas, for example one water well doubled in gas concentration to explosive levels within two years of active methane production near the well. Another water well tested in 1999 at 100% methane concentration, and now is subject to spontaneous combustion, the precursor for underground coal fires. Baseline testing, impact analysis, and a mitigation plan must be completed for the study area, and included in the Wyodak EIS document, with opportunity for public comment.

3-19
4-40
Aquifer drawdowns: Table 4-3 shows maximum drawdowns in the coal aquifers expected to be 400' and more. Since there is some commingling of the aquifers naturally and because of the unintentional failures of wells and drilling activity, we can expect all aquifers to drop at a corresponding rate with Coalbed methane dewatering. This is confirmed by data from area monitoring wells. Although the Water Well Mitigation Agreement is required by this EIS, it isn't enough to address the future water needs of 33,000 people in Campbell County. Long range mitigation plans are needed in this EIS, plans that include the water needs of the cities of Gillette and Wright, as well as rural residents and ranch use.

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7-13-99 Wyodak Coalbed Methane Draft EIS Comments

acres of 1,200 acres or more and a rural character, into a polluted industrial site, extensively scarred, with little resale value. No consideration has been given for impacts to private property values and tourism businesses such as outfitting. Many outfitters who operate in the Powder River Basin guide companies will probably be impacted by this project. No one wants to vacation in an industrial site. Mitigation plans for these impacts must be included in this EIS.

Sincerely yours,

Laurel S. McCord
Laurel S. McCord

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CMS ENERGY
Oil and Gas

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BUREAU OF LAND MANAGEMENT
JUN 15 1999
BUFFALO FIELD OFFICE
BUFFALO WY

July 14, 1999

United States Department of the Interior
Bureau of Land Management
Buffalo, Wyoming Field office
1425 Fort Street
Buffalo, WY 82834
Attention: Mr. Richard Zander

Faxed to 307-684-1122, Federal Expressed on 7/14/99

Re: Wyodak Coal Bed Methane Project
Draft Environmental Impact Statement (DEIS)

Dear Mr. Zander:

CMS Oil and Gas Company ("CMS") is a coal bed methane operator with a fifty percent (50%) interest in over 500,000 acres of leasehold in the Powder River Basin. Approximately 35% of our leasehold is on federal lands. We appreciate the opportunity to comment on the Wyodak Coal Bed Methane Project, Draft Environmental Impact Statement.

GENERAL COMMENTS

While the introduction to the DEIS requests specific comments, CMS wishes to make several general comments that we believe are very significant to the EIS. First, CMS strongly supports Alternative I as the appropriate development model for the EIS.

Second, there are numerous cases throughout the DEIS in which the BLM appears to readminister/create regulations applicable to fee lands over which it has no jurisdiction. Below we will identify a few specific examples of this.

Thirdly, the DEIS assumes proposed CBM development to occur on 40-acre spacing. It is currently CMS's intent to locate wells in many areas on 80-acre spacing and there is the distinct possibility that 160-acre spacing or greater may be utilized in the future. This would obviously reduce surface impacts proportionately.

SPECIFIC COMMENTS

On Page 2-16, Paragraph 5 the DEIS shows possible ways in which mitigation could be accomplished at the cost of the operator. In the event the operator is deemed to be at fault, he should only be responsible for his proportionate share of mitigation costs. In preliminary baseline work, we have witnessed changes in the hydrogeological system absent CBM development (i.e. loss of head due to onshore depletion from existing flowing stock wells).

On Page 2-17, the third paragraph addresses the PRAGMO concept and reporting. Operators should not be required by a regulatory agency to join an organization to represent its interests. While a company may support PRAGMO, the obligation to join such an organization should not be a requirement to operate on BLM property. Furthermore, CMS believes reporting should be to a single regulatory agency, specifically the Wyoming Oil and Gas Conservation Commission. We would change the end of the 4th sentence of the paragraph from "to the BLM and WSEO" to "to the WOGCC". We would also replace "the following specific activities will be required" in the fifth sentence with "existing regulations will be followed."

On Page 2-17, the first sentence under the subheading Groundwater: Add "for projects on BLM land" to the end of the 1st sentence.

On Page 2-17, strike the 2nd sentence of the second bullet. The WSEO does not currently require a monitoring plan.

On Page 2-17, 3rd bullet: The first sentence of the 3rd bullet should suffice "Periodic monitoring of static water levels in CBM production as required by the WSEO" and strike the rest of the bullet.

On Page 2-20, under the "Cost Share on Wells ....." heading, strike the last 2 sentences and replace with "the cost of BLM requirements above and beyond a basic monitoring well shall be borne by the BLM."

On Page 4-14, 7th Bullet, any discharge limitation created by this EIS must be subject to future study, analysis and possible correction of allowable and equitable discharge. Further, CMS questions the authority of the BLM to limit discharge volumes.

On Page 4-14, 8th bullet, CMS believes there will be instances where it will be beneficial to discharge water into a spring area (i.e. maintaining riparian habitat). Therefore, we believe that spring mitigation should be dealt with on a case by case basis.

On Page 4-15, 9th bullet, add "reasonable" before time frames and "operators" after landowners.

On Page 4-67, 1st bullet, last sentence refers to 1.8 acres of potential disturbance per well. While the word potential is certainly appropriate here, a more likely average would be around 1.1 acres (well site .22 acres, access/pipelines .9 acres). This only becomes significant if in your total impact analysis you utilize the 1.8 acres as your multiplier for basin wide impacts.

Under Appendix B, Standard Conditions of Approval for APD's, numerous requirements are made relative to watershed management and monitoring plans which appear to include non federal lands in their analysis. Approval of APD's should not hinge on the treatment of non-jurisdictional lands. Water management and monitoring plans must be limited to BLM

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jurisdictional lands. Water management and monitoring plans off of BLM leases are between the landowner and operator and subject to jurisdictional regulatory authority.

On Page B-4, a class 3 cultural inventory may not be possible if the surface is privately owned and the landowner does not grant consent for the inventory.

Again, we appreciate the opportunity to comment on the Wyodak Coal Bed Methane Draft Environmental Impact Statement and we look forward to continued involvement and a timely completion of this process.

Respectfully submitted,

Michael W. Bernard
Environmental, Health and Safety Manager

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HOLLAND & HART
ATTORNEYS AT LAW

[illegible]

Marilyn S. Kite
(307) 734-4303
mkite@hollandhart.com

July 13, 1999

BUREAU OF LAND MANAGEMENT
JUN 15 [illegible]
BUFFALO FIELD OFFICE
BUFFALO, WY

Via Federal Express

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Re: Comments on the Wyodak Draft Environmental Impact Statement

Dear Mr. Zander:

This letter provides comments on the Draft Environmental Impact Statement (DEIS) for the Wyodak Coalbed Methane (CBM) Project. Comments in this letter pertain only to cumulative impacts to Air Quality Related Values (AQRVs) in Class I and Class II sensitive areas and the modeling conducted to arrive at those impacts. For a number of reasons, we believe the cumulative AQRV impacts predicted in the DEIS are unrealistically high. Several problems exist regarding the methodology BLM used to predict cumulative impacts to AQRVs.

First, the model and source emissions for railroads does not recognize EPA's adopted Best Available Control Technology (BACT) for railroad locomotives. The estimate of emissions from locomotives used in the model are nearly twice those allowed by BACT. Any new locomotives used to transport Powder River Basin Coal would have to comply with BACT. BACT could be reasonably argued to apply to all coal transported from the Powder River Basin in excess of current production levels. This fact should be included in the model assumptions and the source emissions corrected.

Second, we have some questions regarding the methodology used by BLM in the CALMET/CALPUFF modeling. We contracted with Environ (CALMET/CALPUFF modeling consultant) to review the Wyodak Modeling Protocol and the CBM Project Air Quality Impact Analysis Technical Reference Document. These were compared to similar documents/protocols for two other ongoing BLM Wyoming projects which are also using CALMET/CALPUFF modeling for prediction of air quality impacts. Environ's critique is attached in a memorandum to PIC Technologies, Inc. dated July 12, 1999. As you will see, the memo points out a number of inaccuracies in the model assumptions used for the Wyodak CBM Project.

In addition, the directions of rail traffic used to predict impacts is over-simplified. In fact, all the rail traffic was projected by BLM to run north-south along the existing joint line. Please be advised that DM&E Railroad is proposing to construct an east-west line between the coal mines and Wall, South Dakota around the south side of the Black Hills. DM&E's preferred route has been provided to BLM through right-of-way applications and should be modeled as part of reasonably foreseeable development. Assuming all incremental coal production would be transported down the joint line is unreasonable in light of DM&E's proposal. DM&E's specific route needs to be incorporated into additional model runs for the Final EIS (FEIS).

All of the problems pointed out in this letter lead to a gross overestimation of cumulative impacts to AQRVs in Class I and II areas. These problems need to be resolved and a more realistic estimate provided in the FEIS. A second model run with revised assumptions and accurate information is essential. In addition, we understand the BLM may have intentions of applying the Wyodak modeling results to other future projects (as baseline). This should not be allowed until BLM corrects the deficiencies pointed out in this letter.

Very truly yours,

Marilyn S. Kite

Marilyn S. Kite
a Partner of Holland & Hart

MSK:tw
Enclosure

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ENVIRON

MEMORANDUM

To: Mary [illegible], PIC Technologies, Inc.

From: Ralph Morris

Date: July 12, 199[illegible]

Subject: Review of the WYODAK EIS CALMET/CALPUFF modeling

INTRODUCTION

The Wyodak Coal Bed Methane (CBM) project proposes to drill, complete, operate, and reclaim approximately 3,[illegible]00 new production CBM wells and related production in the east Powder River Basin area in northeastern Wyoming (located in Campbell and Converse counties). The Wyodak CBM project is required to submit an Environmental Impact Statement (EIS) as part of the National Environmental Policy Act (NEPA) to evaluate the significance of the air quality and air quality related value (AQRV) impacts due to the proposed action and the cumulative impacts due to all existing and new sources. Of particular concern are the impacts of the Wyodak CBM project and other new sources on visibility degradation at protected sensitive Class I and II receptor areas including: Badlands and Wind Cave National Parks; Black Elk, and Cloud Peak Wilderness areas; Jewel Cave, Mt. Rushmore, and Devils Tower National Monuments; and Northern Cheyenne Reservation.

Two other recent Environmental Impacts Statements have been or are in the process of being prepared for the Continental Divide/Greater Wamsutter II/Riggs (CD EIS) and Pinedale Anticline (PA EIS) natural gas field developments. These studies also did cumulative emissions visibility impact assessments and predicted fairly similar results when similar IWAQM/FLAG visibility screening methods were utilized. It is useful to compare the Wyodak CBM project visibility impacts with the two other EIS impacts to put them in context.

WYODAK CALMET/CALPUFF MODELING

Overarching Concerns

The analysis of the Wyodak CBM CALMET/CALPUFF modeling is based on the review of two documents: (1) the Wyodak Modeling Protocol (Greystone, 1998); and (2) the Wyodak CBM Project Air Quality Impact Analysis Technical Reference Document (AQTRD) (Greystone, [illegible]). These two documents provide a very poor documentation of what observational data were used in the CALMET/CALPUFF modeling and how the data were used to post-process the modeling results to estimate the visibility impacts. In particular, the sources of key input parameters including the terrain, land use, observed surface meteorological network, background ozone, background ammonia, sources of relative humidity used in the visibility post-processing, CALPUFF dry and wet deposition parameters, etc. are not described. What little description provided suggests that the Wyodak CALMET/CALPUFF modeling was performed by an air quality modeler(s) with experience in applying EPA "cook book" methods for steady-state Gaussian plume dispersion modeling (e.g., ISC) for permit for near-source type source review (NSR) impacts assessment but with little CALMET/CALPUFF modeling experience. The Wyodak CALMET/CALPUFF documentation is insufficient and the explanations superficial, all of which suggests that the Wyodak air quality modeler(s) have little experience in applying the CALMET/CALPUFF modeling system. Thus, the lack of documentation of key input parameters raises concerns regarding their validity which can only be ascertained through examination of the model input and output files, which were not available for this review.

From what was provided in the documentation, we identified two overarching concerns regarding the Wyodak CALMET/CALPUFF modeling:

Fixation with Computation Time at the Expense of Performing the Correct Technical Modeling of the Sources Under Study: The computer run times of CALPUFF depend on the number of puff/receptor "hits" which in turn depends on the number and types of sources and number of receptors used as input. The Wyodak CBM project air quality modeling examined impacts at 7 sensitive receptor areas using only [illegible] receptors. The CD EIS and PA EIS performed their CALPUFF modeling using over twice this amount of receptors. More disturbing is the fact that the Wyodak CBM project CALPUFF modeling went to extensive efforts to reduce the number of sources by modeling diffuse sources as concentrated sources (e.g., the diffuse railroad line sources are treated as concentrated sources located every 10-km apart) and combining multiple sources into single sources to reduce the total number of sources. In fact, in some cases the Wyodak documentation suggests that different sources located more than 20-km apart were combined into a single source (Section 3.4.2.6, Page 3-34 of the Wyodak AQTRD), presumably this was done solely to reduce the computational time of the CALPUFF simulations. The concentration of emissions from many separate diffuse sources into a single source results in a concentrated plume with much higher concentrations than there should be and, consequently, much higher estimated impacts at the sensitive receptor areas.

Treatment of Chemistry and Equilibrium: Since the NOx emissions from the modeled sources and the resultant visibility impacts due to particulate ammonium nitrate appear to be the critical air quality related issue under study, we are concerned that the chemistry and sulfate/nitrate/ammonia equilibrium may not be treated correctly in the Wyodak CBM project

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CALPUFF modeling. Since there is no mention of what background ozone and ammonia was used as input and these inputs are critically important, we can only conclude that the modelers did not consider this issue in detail and likely used the CALPUFF default values. The CALPUFF default background ammonia value is 10 ppb which is much too high for this area, likely over a factor of 10 too high for the northeastern Wyoming region and vicinity. Thus, if ammonium nitrate formation is ammonia-limited (which is likely given the abundance of the diffuse NOx emissions as concentrated plumes), the CALPUFF-estimated ammonium nitrate concentrations may potentially be a factor of 10 too high just due to the possible specification of too high background ammonia yet these modeling the diffuse NOx sources as concentrated "point" sources.

Emission Inputs

The treatment of emission sources appear to be fairly reasonable (e.g., compressors as point sources and wellsite emissions as area sources) with two notable exceptions:

1. The treatment of Coal Train Emissions (Section 3.4.2.5, Page 3-20) essentially treats these emissions as isolated "point" sources located 10-km apart concentrating their emissions thereby greatly overestimating their concentration impacts. Locomotive NOx, PM, and other emissions from a 10-km segment of railroad track are combined into a 5-m by 5-m area source (effectively a "point" source) with a 5-m release height. Locomotive emissions are in reality diffuse buoyant line sources with high initial dispersion due to the turbulence caused by the movement of the train, thus they should be treated as such in the CALPUFF modeling. As CALPUFF contains a buoyant line source input treatment, the reasons for treating locomotive emissions as an effective "point" source in the Wyodak CALPUFF is technically incorrect and not justified.
2. As discussed above (under Overarching Concerns) considerable effort was expended combining sources to limit the number of puffs being modeled in CALPUFF presumably to reduce computational requirements. By combining many sources (some over 20-km apart) into a single source, the CALPUFF modeling will greatly overestimate the calculated concentration impacts and resultant adverse effects.

CALMET Modeling

The CALMET modeling was performed on a 126 x 94 5-km x 5-km grid covering northeastern Wyoming and vicinity (see Figure 3-1 of the Wyodak CBM project AQTSD). CALMET was exercised for the 1990 calendar year to generate three-dimensional wind fields for CALPUFF modeling.

Terrain and Land Use: No information on the source of the terrain and land-use data used in the Wyodak CBM project CALMET modeling was provided.

Meteorological Observations Used: An archived historical MM4 prognostic model database at 80-km resolution was used as input into CALMET to represent the gross synoptic characteristics of the 1990 meteorology. The 80-km meteorology was used with twice-daily upper-air meteorological observations from 5 sites, presumably an unspecified number of surface meteorological observations, and 4 precipitation observation sites in the area. The characterization of the upper-air meteorology (80-km MM4 plus 5 NWS upper-air observation sites), appears to be as good as you can do with available data for the 1990 year. Note that both the CD EIS and PA EIS CALMET modeling used MM5 output at 20-km resolution which would provide much better characterization of synoptic flows and perturbations of the flow fields due to large-scale terrain features which would not be present in the 80-km MM4 fields. Without knowing the number and type of surface meteorological observation sites it is impossible to comment on their adequacy and appropriateness. As a point of reference, the CD EIS and PA EIS used surface meteorological observations from, respectively, 22 and 43 sites. We believe that the CD EIS surface meteorological observation network of 22 sites, which failed to include over half of the available surface observations, may have been insufficient, or at least did not make use of all available data. The number of surface meteorological sites used in the Wyodak CALMET modeling should be comparable to the other studies. Using just 4 observed precipitation observation sites to characterize rainfall across the 600-km by 425-km Wyodak CBM project CALMET modeling domain is woefully inadequate given the spotty nature of precipitation. Again, as a point of reference the CD EIS CALMET/CALPUFF modeling domain, which is of comparable size as used in the Wyodak CBM project modeling, used precipitation observations from 57 sites. Similarly, the PA EIS CALMET/CALPUFF application, which used a smaller domain than the Wyodak CBM project, used precipitation observations from over 10 times as many sites as the Wyodak CBM project CALMET modeling.

CALPUFF Modeling

The CALPUFF model was used to simulate the impact of the Wyodak CBM project emissions and the cumulative emissions due to all new permitted and reasonably foreseeable development sources from 1988 on (post-1988 sources). As noted above, it appears that significant technical degradation of the CALPUFF modeling was made through extensive combination of sources solely to reduce computational requirements with no technical justification. It is our belief that these technical degradations in the Wyodak modeling analysis led to the excessive calculated visibility impacts in the cumulative impact scenarios. Again, as noted above, we also have concerns that the chemical conversion rate of SO2 to sulfate and NOx to nitrate and the sulfate/nitrate/ammonia equilibrium may also have some deficiencies. However, no information was provided on the background ozone and ammonia used and how the information

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of source groupings was handled in the post-processing to make any definitive statements in this area.

CALPUFF Options: The CALPUFF options were based on the IWAQM Phase II recommendations (EPA, 1998) which were based on the CALPUFF4 model so do not include recommendations for some of the newer advanced features of the CALPUFF5 model. For example, the IWAQM Phase II recommendations noted that the MESOPUFF II chemical mechanism was deficient in its treatment of some chemical processes but recommended it since it was the best mechanism in CALPUFF4. An improved chemical mechanism based on the ARM3/RIVAD model was added to CALPUFF5. Both the CD EIS and PA EIS CALPUFF modeling used the improved ARM3/RIVAD mechanism, however the Wyodak CBM project strictly followed the IWAQM phase II recommendations without regards to the newer advances and new capabilities of the version 5 of the CALMET/CALPUFF modeling system, thus the Wyodak CALPUFF modeling specified the MESOPUFF II chemical mechanism. The CALPUFF dispersion parameters and other options provided in the documentation similarly followed the IWAQM Phase II recommendations and, for the most part, appear to be consistent with those used in the CD EIS and PA EIS CALMET modeling.

CALPUFF Post-Processing: The post-processing of the CALPUFF modeling results to obtain visibility impacts appears to have followed the IWAQM/FLAG recommended approach. This approach uses a seasonal background extinction based on the mean of the 20 percent of the cleanest days from the IMPROVE reconstructed PM mass and seasonal relative humidity adjustment factors. The resultant incremental impacts from the CALPUFF modeled sources are compared with the 0.5 and 1.0 dv perceptibility thresholds of the, respectively, National Forest Service (NFS) and National Park Service (NPS). This same approach is being utilized in the PA EIS visibility analysis. A similar approach, albeit with significant deviations, was also used in the CD EIS technical documentation (METHOD 2), but a less stringent approach was actually used in the CD EIS (METHOD 4 based on transmissometer data).

When using a similar approach (IWAQM/FLAG recommended methods) to assess the visibility impacts in the cumulative impact analysis (all new sources), the CD EIS and PA EIS estimated that the maximum number of days per year the NFS 0.5 dv threshold of perceptibility would be exceeded at any sensitive Class I or II area ranged from 5-10 days per year. The Wyodak CBM project cumulative impact analysis, on the other hand, estimated that the NFS 0.5 dv perceptibility threshold would be exceeded at sensitive Class I areas from 116 days (Badlands National Park) to 136 days (Wind Cave National Park) per year (Page 6-8 of the Wyodak AQTSD). Thus, the Wyodak CBM project cumulative impact analysis is estimating that "significant" (> 0.5 dv) visibility degradation impacts occur at sensitive Class I receptor areas approximately a third of the days during the year. Using the same (or similar) visibility screening methods (IWAQM/FLAG method), the CD EIS and PA EIS analysis estimate that the cumulative emissions scenario results in such significant impacts (> 0.5 dv) a tenth to fifth (5-10 percent) of the time that the Wyodak cumulative analysis estimates such a threshold

would be exceeded.

We believe that the high number of days of adverse visibility impacts in the Wyodak CALMET/CALPUFF cumulative impact assessment are mainly due to the incorrect characterization of diffuse emission sources as concentrated sources (e.g., [illegible] emissions are modeled as discrete "point" emission sources located 10-km apart; multiple sources are combined into single sources, some located more than 20 km apart from each other). Although there is insufficient information in the Wyodak documentation to determine this, we also suspect that the treatment of the chemistry/equilibrium of ammonium nitrate formation is inadequate and overstated in the Wyodak CALPUFF modeling.

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National Mining Association

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BUREAU OF LAND MANAGEMENT
JUN 15 [illegible]
BUFFALO FIELD OFFICE
BUFFALO, WY

July 12, 1999

Mr. Richard Zander
Bureau of Land Management-Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Re: Draft Environmental Impact Statement for the Wyodak Coalbed Methane Project. 64 Fed. Reg. 26406 (May 14, 1999)

Dear Mr. Zander:

This letter responds to the Bureau of Land Management's (BLM) request for comment on the above-referenced Draft Environmental Impact Statement (DEIS) analyzing the potential impacts and cumulative effects of proposed coalbed methane (CBM) development on Federal lands and minerals for areas north and south of Gillette, Campbell County Wyoming. The National Mining Association's (NMA) members include the producers of more than 70% of the coal mined in the Nation, many of which operate mines and own or lease coal reserves in the area covered by the DEIS. Moreover, our members retain a continuing interest in acquiring additional coal reserves in the area in order to supply the fuel and products necessary for our Nation's continued economic vitality. Coal is the primary source of energy produced domestically, and provides the source of fuel for the generation of 57% of the electricity consumed in this country. See Energy Information Administration, *Monthly Energy Review*, February 1999 at 5, 95.

Because coal is an important source of energy and raw material in almost every phase of our nation's daily life and well-being, these comments focus upon two related issues: (1) the disposition and leasing of coal and CBM on federal lands; and (2) the conflicts in the development of coal and CBM resources when title and control over them are split between different parties. With respect to both issues, the DEIS only provides bare statements without supplying any support for the declarations or analysis of the economic or social effects that follow from the proposed actions in view of inevitable conflicts that will arise.

We realize that with respect to the issue of the appropriate disposition of federal CBM interests, considerable uncertainty remains in view of legal developments over the past several years. Nonetheless, this uncertainty compels even greater care and attention by BLM in its discussion, analysis, and consideration of alternatives for the proposed actions. As for conflicts, they have been present well before the recent Tenth Circuit and Supreme Court decisions which only pertain to 1909 and 1910 Coal Lands Act. See *Southern Ute Tribe v. Amoco Production Co.*, 151 F.3d 1251 (10th Cir. 1998), *rev'd* ___ U.S. ___, 1999 WL 358004 (1999) (hereinafter "*Amoco*"). The potential for conflicts between coal and CBM development was created by the 1981 Solicitor's Opinion. These conflicts now exist in the area covered by the proposed action and must be addressed and analyzed. As it stands, the DEIS fails to supply a proper analysis of the social and economic impacts related to these issues as required by the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4332, and its implementing regulations, see, e.g., 40 C.F.R. § 1502.14, §1502.2.

Authorizing Actions - Disposition of CBM on Federal Lands

The DEIS notes that the current framework for the disposition of CBM on federal lands is under review. DEIS at 1-5. Indeed, the 1981 Solicitor's Opinion, 88 I.D. 538, that addressed the issue of leasing CBM has been withdrawn after a reexamination that, in the Department's own words, revealed that the opinion was "incorrect." See Fed. Br. in *Amoco* 46. Accordingly, the opinion's conclusion that CBM was presumably leased to those who were leased federal oil and gas leases no longer stands.[1]

The recent Supreme Court decision only resolves the question of CBM ownership on lands patented under the 1909 and 1910 Coal Lands Acts. As the Department recognized in that litigation, "[t]he question of what Congress reserved under the Coal Lands Act is distinct from the question of how the government chooses to lease it under the MLA." Fed. Br. 38. In this regard, the Department identified a substantial number of legal and practical considerations that cast grave doubt upon claims that CBM development rights were conveyed as part of federal oil and gas leases.

To begin with, the Department explained that "it is reasonable to interpret 'coal' to include all of the coal's naturally co-existing constituents, including components that would be liquids or gases if physically separated from the coal." Fed. Br. 25. Moreover, it is commercially impractical to assume that federal oil and gas leases "conveyed to others the inextricably adsorbed component of [coal] that the miner necessarily remove[s] as part of the mined product." *Id.* at 21. See also *id.* at 20 ("it is impossible for miners to remove coal without also removing the inextricably adsorbed CBM"). According to the Department, "CBM that resides within a coal stratum is part of the coal owner's coal estate, and any attempt by the owner of the relevant non-coal estate to drill into that stratum and extract the CBM therein is a trespass on the coal owner's property rights." Fed. Br. 25. Accord *Vines v. McKenzie Methane Corp.*, 619 So. 2d 1305, 1308 (Ala. 1993) (CBM and coal are inextricably intertwined, and grant of all coal includes CBM); *United States Steel Corp. v. Hoge*, 468 A.2d 1380, 1384 (Pa. 1983). (CBM

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[1] As for the prior conclusion that CBM was leased as part of federal oil and gas leases, the 1981 opinion also cautioned that "nothing in this opinion warrants title to any oil and gas deposit." 88 I.D. at 549.

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present in coal seams necessarily belong to the owner of coal; *Lillibridge v. Lackawanna Coal Co.*, 22 A. 1035, 1037 (Pa. 1891) (ownership of coal estate includes the space it occupies). The BLM federal coal lease grants the lessee the exclusive right and privilege to drill, mine, extract, remove or otherwise process and dispose of the coal deposits under the land. § 2, Form 3400-12. When a lessor conveys a portion of his property (here the coal deposits) to another, the lessor cannot thereafter maintain that what remains in the property conveyed remains a part of his estate.

The Department's most recent discussion and analysis, therefore, suggests that where the United States owns oil, gas and coal, CBM is part of the coal estate granted under a federal coal lease, and was not conveyed under a oil and gas lease. Practical considerations and consequences further support the view that the grant of the exclusive right and privilege of coal development rights under a federal coal lease includes dominion and control over CBM within the coal deposit. The most critical aspect of a grant of the coal estate is the possession, dominion and control over it in order to mine and remove the coal. See *Williams v. Gibson*, 4 So. 350, 353-54 (Ala. 1888). CBM is physically bound (adsorbed) in the coal and is released in the mining process. A. Kim & F. Kissell, *Methane Formation in Coalbeds*, in Department of the Interior, *Methane Control Research: Summary of Results 1964-1980* [illegible] (Bureau of Mines Bulletin 687, 1988). Because the hazards CBM poses to mine safety, mine operators must, as a matter of necessity and law, monitor, control, and ventilate CBM at all times to avoid explosions and asphyxiation. See Mine Safety Act § 303, 30 U.S.C. § 863. See also [illegible] *Coal R.R. Co.*, [illegible] U.S. [illegible] ([illegible]). As is readily apparent from the inherent nature of both the coal resource and the methods of mining it (whether surface or underground, and whether today or a century ago) the coal cannot be mined without the release of CBM. Therefore, it is unreasonable to infer that CBM in coal deposits were conveyed by implication under federal oil and gas leases when it has been well-known that CBM is liberated and destroyed in the mining of the coal.

The CBM extraction techniques also compromise the coal lessee's possession and control over the coal estate. See *Vines v. McKenzie Methane Corp.*, 619 So. 2d at 1308 (the process of drilling for CBM intrudes on the process of mining for coal). Since the object of commercial extraction of methane from coal is not the free gas associated with the surrounding rock strata, but rather, the methane molecularly bound in the coal, the extraction methods target and complete a well in the coal deposit. For many coals, stimulation techniques are used to increase the rate of methane desorption. See *Legal Environmental Assistance Foundation, Inc. v. U.S. Env't Protection Agency*, 118 F. 3d 1467, 1470-71 (11th Cir 1997) (coalbeds must be fractured to induce significant flow of gas). The most frequently used stimulation technique known as hydrofracturing (or "fracing") is especially invasive to the coal estate since it involves the injection of fluids and suspended solids to create and hold open fractures in the coal. See *Legal Environmental Assistance Foundation Inc.*, 118 F.3d at 1471 (describing the results of hydrofracturing as fractures that extend several hundred feet with significant amounts of injected fluids and other additives left in the coal). In certain circumstances, these techniques may damage the coal seam, render the coal unmineable, or increase the costs of mining.

In sum, the assertion that CBM was conveyed by implication under federal oil and gas leases poses grave consequences for the safe, orderly and economic development of the coal granted in a federal coal lease. Such a view would seriously compromise the coal lessee's possession, dominion and control over the coal estate granted in the lease. In short, it would be tantamount to a destruction of the grant itself. See *Vines v. McKenzie Methane Corp.*, *supra*; *Williams v. Gibson*, *supra*.

The question of whether CBM was conveyed by implication under federal oil and gas leases should also be examined in view of surrounding circumstances and intent of the parties at the time the leases were executed. See *Vines v. McKenzie Methane Corp.* 619 So. 2d at 1307; *[illegible] v. [illegible]*, [illegible] P 2d [illegible], [illegible] (Utah [illegible]). It appears highly improbable that BLM's intent was to convey CBM under oil and gas leases in view of the enormous practical consequences it would hold for the coal estate. At the time many of these leases were executed, CBM was considered a dangerous byproduct of the coal estate, and the gas that was considered the subject of the grant under the oil and gas lease was the conventional natural gas that was generally considered commercially exploitable at that time. An examination of federal oil and gas lessees' exploration and production activities at the time the leases were issued would likely confirm the absence of intent to convey CBM as part of the lease. See, e.g., DEIS at 4-3 ("In the project area, oil and gas have been produced from geologic formations extending several thousand feet below the coal seams"); Draft Gillette South Coal Bed Methane Project EIS ([illegible]) at 31 (March 1997) (describing the formations below the Wyodak coal seams that historically were the subject of federal oil and gas leasing). The existence of CBM in coal has been well-known for centuries, it is only its "commercial discovery" that is of recent vintage. See DEIS at 3-6 ("Drilling for CBM resources within the PRB began in the 1970s. Production statistics begin with the year 1987"). The historic lack of diligence in exploiting the CBM under oil and gas leases make it almost inconceivable that the BLM intended to convey CBM with the oil and gas lease. If, indeed, the CBM was conveyed, the prolonged absence of CBM production from coal seams under these leases would call into serious question BLM's vigilance in ensuring that the lessees met its obligations for the diligent development of the resource. See, e.g., 43 C.F.R. 3107.1 ("Actual drilling operations shall be conducted in a manner that anyone seriously looking for oil and gas could be expected to make in that particular area, given the existing knowledge of geologic and other pertinent facts").

In view of the significant and substantial questions related to both the prior and future disposition of CBM development rights on federal lands, the DEIS fails to evaluate this fundamental question which so plainly underlies the proposed action and its potential impacts and cumulative effects.

Conflicts

The conclusions reached in the now withdrawn 1981 Solicitor's Opinion created potential conflicts between coal and CBM developers. Remarkably, the opinion for the most part made no attempt to address these inevitable conflicts despite its recognition that CBM exists in the coal itself. NEPA does not allow BLM here to avoid discussing and analyzing these issues and their impacts, particularly since these conflicts now manifest themselves in the area covered by the proposed action.

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The issue of conflicts was identified in the scoping process as a principal concern that must be addressed in the EIS. See March 18, 1998 Scoping Summary, DEIS App. C. Yet, the DEIS only makes sweeping assertions that conflicts may occur and without any explanation or analysis proceeds to make two general propositions for the development of the inextricably interrelated resources. DEIS at 4-3.

In view of the conflicts that do exist today with respect to existing coal leases and operations, as well as the inevitable conflicts that will continue to arise in the future with the expansion of coal mines to meet our nation's energy needs, BLM must provide a more comprehensive discussion of the impacts such conflicts will have on the present and future development of federal coal resources. On this point, the DEIS simply opines that:

> Development of CBM wells would be precluded in areas of active or impending coal mining. Locating wells in areas where future mining may take place would preclude mining during the life of the wells located in the proposed mining area. Coal in these areas would be mined after CBM extraction is completed or terminated, or after an agreement is negotiated between the CBM operator and coal mine operator.

DEIS at 4-3.

To begin with, our observations disclose that notwithstanding its declaration in the DEIS, BLM has not acted to preclude CBM development in areas of active or impending coal mining. BLM should explain in any final EIS how it plans to implement such a policy as well as ensure that federal coal lessees are not impeded in their development plans by unwarranted claims by CBM developers that coal mine operators must compensate for CBM that escapes during mining. After all, as the Supreme Court recognized, the right to mine the coal implies the right to release gas incident to coal mining." *Amoco*, Slip Op. at 13. See also, *NCNB Texas National Bank, N.A. v. Watkins*, 621 So. 2d. 212, 220 (Ala. 1993) ("The grant of coal mining rights would be useless if it did not include the right to ventilate methane gas from the coal mining area"); *United States Steel Corp. v. Hoge*, 468 A. 2d at 1384 (right to ventilate gas from coal seam part of rights granted to coal); *Williams v. Gibson*, 4 So. at 353 (one who is granted exclusive right to mine coal has right of possession and control necessary to carry on mining operations, and is not liable for incidental damages necessarily occasioned by the ordinary operation of his mines).

As for the second proposition that the location of wells in areas where future mining may take place will preclude coal mining during the life of the wells, this unadorned statement cannot stand without further explanation and analysis of its impacts.[1] On its face, this statement suggests a de facto moratorium on coal leasing in one of the nation's most important coal regions. Surely, this is not what BLM proposes. In any event, the agency needs to fully analyze the impacts on the nation's energy supply and economy posed the proposed action and attendant development conflicts.

Toward this end, we offer the following observations in order to assist BLM in this analysis:

- The active mines within or adjacent to the proposed action area supply almost 300 million tons of coal annually (see DEIS at 3-4) or about 30% of the total domestic production. The projections used by BLM indicate that by 2015, production for Powder River Basin mines is expected to reach 350-400 million tons annually. DEIS at 4-115.
- According to the DEIS, by 2005 coal production is expected to generate $1 billion more of total economic activity annually than CBM production is expected to contribute over the 15 year production life of all the wells subject to the proposed action. DEIS at 4-115 (annual coal production to contribute $2.6 billion of economic activity, CBM production to contribute $1.6 billion over life of the project).
- Coal production will support 11,000 full-time positions while CBM development will require long-term workforce of only 200 employees. DEIS 4-115 & 4-116.
- The annual federal royalty revenue from coal mines in Wyoming ($1.7 billion) is almost twice the amount of federal royalties expected to be generated over the entire life of the proposed CBM development. See MMS, Coal Revenue 1998, Table 1; DEIS at 4-110.

This economic disparity between the proposed action for CBM development and coal development on federal lands is not surprising when one evaluates the impacts of conflicts between resource developers. According to the DEIS, it is estimated that the sale value generated over the life of a CBM well is $323,000. A federal coal lessee who would be forced to bypass the coal within the 40 acre spacing unit would leave behind almost 5 million tons of coal with a sales value of about $25 million.[2]

In view of this substantial disparity in the economic value of the two resources, the DEIS suggestion that future coal mining would be precluded in areas where wells are located under this

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[1] We presume that by "future mining", BLM means areas that have not been leased for coal or are not the subject of a pending coal lease application. BLM should clarify this point when it performs the necessary analysis under NEPA.

[2] The tons of coal lost is derived by assuming a 70 foot coal seam with a coal density factor of 1770 tons per acre foot of coal thickness, e.g. 1 acre x 70 feet x 1770 tons/acre. The sales value is based on the Wyoming Geo Notes (Vol. 61, March 1999) breakdown of average prices ($5.03) paid in 1997 for coal from northeastern Wyoming, Table 12 p. 33.

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proposed action is deeply involved. Moreover, the nation's substantial dependence upon coal from this region as a fulcrum for electricity makes this suggestion untenable from the standpoint of national energy policy.

In connection with the cumulative analysis here the proposed action and alternatives will affect the safe, orderly and economic development of coal under either existing or future leases, the BLM must [illegible] the potential conflicts for existing coal [illegible] operations [illegible]. The [illegible] development of coal [illegible]. The [illegible] obligations for diligent development [illegible] weighing the competing needs and economic considerations. For example, [illegible] production of commercial quantities within [illegible] of their leases. On the other hand, federal oil and gas lessees [illegible] flexibility in terms of diligent production [illegible] in order to maintain their leases. [illegible] CBM [illegible] is to occur on lands that have been, or will be, leased for coal, [illegible] for diligent development [illegible] a manner that will not jeopardize the orderly and economic development of the coal. Given the nature of CBM, a lessee should not be allowed to thwart the development of the coal [illegible] knowing that the CBM will be released when the coal is mined. Since the leasing of coal [illegible] the leasing, development and production of coal [illegible], 30 C.F.R. § 3400.1, those who claim the right to CBM are well aware that coal development inevitably results in the release of the CBM. And, the rule of [illegible] as applied in this context, will allow the coal lessee to dissipate the CBM in order to mine the coal. *Amoco*, Slip. Op. at 13 citing *Williams v. Gibson*, *supra*.[7] Of course, as we set forth at the outset, the scope and frequency of potential conflicts will turn upon the agency's eventual consideration of the question regarding the appropriate disposition of CBM under the leasing program.

Because these questions are so fundamental to the proposed action for the development of Federal coal bed methane, any analysis of the potential impacts and cumulative effects would be fatally incomplete without a more informative discussion of how the agency will address the disposition of CBM under its leasing policies and the conflicts that would arise if CBM and coal are leased in a manner that splits the estate between parties who do not share the same interest in the purpose and manner in which it is to be developed.

Sincerely,

Harold P. Quinn, Jr.
Senior Vice President and
General Counsel

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[7] Because the proposed action here is so closely related to the development of CBM on private and state lands, it bears noting that even on lands patented under the 1909 and 1910 Coal Lands Acts where the Supreme Court in *Amoco* has recently decided CBM was conveyed as part of the surface estate, the reserved coal estate imposes a servitude upon the surface estate (including CBM) that was part of the grant under those Acts. See *Kinney-Coastal Oil Co. v. Kieffer*, 277 U.S. 488, 504 (1928) (a mineral reservation imposes a servitude on the surface estate so the United States may realize a proper return from the extraction of minerals).

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COGEMA
Resources, Inc.

July 13, 1999

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

BUREAU OF LAND MANAGEMENT
JUL 15 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Re: Wyodak Coal Bed Methane Project EIS

Dear Mr. Zander:

We appreciate the opportunity to comment on the Draft Wyodak Coal Bed Methane Project Environmental Impact Statement.

Pathfinder Mines Corporation owns patented and unpatented mining claims in the Pumpkin Buttes uranium mining district, adjacent to the southwest portion of the study area. This includes the North Butte uranium deposit (T44N, R76W) which is permitted for in-situ leach mining. Pathfinder's North Butte ore body resides in the Wasatch formation sandstones, several hundred feet above the prospective coal seams in the Ft. Union formation.

In Chapter 4, under Geology and Mineral Resources, Proposed Action, next to the last paragraph, the draft EIS states "Withdrawal of CBM and water from the stratigraphically lower Ft. Union Fm. would not be likely to impact the potential recovery of uranium resources within or near the project area." While this assumption might be true, it would be necessary to have a hydrologist conduct actual studies in areas of potential conflicts like North Butte. It might be possible that where exploration drilling has intersected both aquifers, hole plugging required under state regulations might not be adequate to prevent migration between the formations. Additionally, with the extreme dewatering contemplated by CBM development, there might be an influence on surface water tables that could affect uranium mining since the deposit must be submerged within the water table in order to be in-situ mined.

Concerns are especially critical near ongoing in-situ projects like the Christensen Mine (T44N, R75W) operated by Cogema Mining, Inc. ISL operations are extremely dependent upon a high degree of groundwater control and containment. The company is required by state and federal regulatory agencies to monitor groundwater on a rigorous basis for a protracted period. Additionally there are surface facilities in place in drainage areas that have been built under certain flood criteria. CBM operators contemplating drilling or de-watering in the vicinity of an operating in-situ mine must demonstrate to the in-situ uranium operator and the state and federal agencies regulating the same, that the uranium operations will not be adversely impacted.

In Chapter 3, Geology and Mineral Resources, the reference in the last paragraph to the Christensen Ranch Mine can be updated to have produced 1.5 million pounds uranium as of the first quarter 1999. After completion of uranium production, groundwater restoration and surface reclamation are anticipated to continue for ten years. Regulatory permit termination and final bond release could be expected a minimum of five years after reclamation.

Sincerely,

Donna L. Wichers

Donna L. Wichers
General Manager

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DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
[illegible]
[illegible]

BUREAU OF LAND MANAGEMENT
JUN 21 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

June 17, 1999

Wyoming Regulatory Office
2232 Dell Range Blvd., Suite 210
Cheyenne, Wyoming 82009-4942

Mr. Richard Zander
U.S. Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Dear Mr. Zander:

This letter is in response to your request for comments on the Wyodak Coal Bed Methane Project Draft Environmental Impact Statement (DEIS) dated May 1999. We received a copy of the DEIS on May 27, 1999. The DEIS addresses cumulative impacts associated with exploration and development of up to 5,000 coal bed methane (CBM) wells in the Gillette area. The project area covers approximately 2,400 square miles, primarily in Campbell County, and includes the Gillette North and Gillette South Assessment Areas.

In response to the scoping notice for the Gillette South EIS dated January 27, 1998, we provided a letter dated February 20, 1998, with clarification of our agency's regulatory role in regard to CBM production activities in that project area. Essentially, the U.S. Army Corps of Engineers regulates activities that result in a discharge of fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). Although the previous letter was sent in response to another EIS, the information contained in our previous letter is general in nature and we agree that it would also apply to the Wyodak CBM project area and we do not object to its inclusion in Appendix A of the DEIS.

We have reviewed portions of the DEIS that are relevant to our regulatory program and offer the following recommendations:

1. On page 3-37 it should be clarified that wetlands are a separate category of waters of the U.S. The statement implies that wetlands are jurisdictional only if located in other waters of the U.S. such as streams and playa lakes, which is misleading. Isolated wetlands/ponds are also subject to regulation. The statement regarding the addition or elimination of produced water to waters of the U.S. also needs clarification by adding "if the activity does not include a discharge of fill material into waters of the U.S." at the end of the sentence. There are instances where placement of fill material could result in the addition or elimination of produced water such as construction of an outfall structure. Page 4-23 contains the same statement and should also be modified.

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BUREAU OF LAND MANAGEMENT
JUN 21 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

2. On page 4-11 under Water Use, it should be noted that authorization from the Corps would normally be required for construction of ponds or reservoirs.

3. It is confusing to discuss other regulatory programs in the context of describing the purpose and need and affected environment (Chapters 1 and 3). We recommend that all discussion of regulatory issues be consolidated into Chapter 5 by moving the discussion of authorizing actions and public participation from Chapter 1.

As you may be aware, our office is currently in the process of developing a Programmatic General Permit (PGP) for oil and gas exploration and development activities in Wyoming. If issued, PGP 98-08 will allow the BLM to assist operators in obtaining a Section 404 permit without contacting the Corps in advance based upon a few simple decisions regarding the level of impact. Essentially, PGP 98-08 would be a consolidation of various Nationwide Permits into a single permit that can also be administered by the BLM. However, the Corps will retain oversight and would be responsible for any compliance issues. It is a little premature to discuss the details of PGP 98-08 in the DEIS but you may want to add a simple statement regarding the Corps current initiative to streamline the permit process by issuing a PGP for oil and gas exploration and development activities with minor environmental impacts to alleviate some of the operators anxiety concerning the need to deal with multiple federal agencies.

Thank you for the opportunity to comment on the DEIS. Mr. Thomas Johnson is the primary point of contact in our office for these comments and PGP 98-08. If you have any questions concerning our involvement, please contact Mr. Johnson at (307) 772-2300. Please reference file No. 199940126 in any future correspondence with our office concerning the Wyodak CBM EIS.

Sincerely,

Matthew A. Bilodeau

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

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"Kathy Moriarty" [illegible] on [illegible] PM

Please respond to [illegible]

To: Richard Zander/[illegible]
cc:
Subject: Environmental Impact Study/Wyodak Coal Bed Methane Project

BUREAU OF LAND MANAGEMENT
JUN 2 2 [illegible]
BUFFALO FIELD OFFICE
BUFFALO WY

Dear Mr. Zander:

I am writing to express my concerns regarding the Wyodak Coal Bed Methane project Environmental Impact Study. I believe the study has some significant deficiencies which I would like to see addressed. Let me list several of them:

1. Wild life

The study notes that wildlife will definitely be affected yet no mitigation plan is set out for public comment. A process of receiving public input on these issues needs to be included.

2. Beneficial Use of Groundwater

Although it is stated that "the State of Wyoming requires water produced in conjunction with CBM to put to subsequent beneficial use", the EIS does not adequately define what use the water may be used which would constitute beneficial use. There needs to be a clear beneficial use plan for citizens to comment on. Currently most CBM water is simply being discharged onto the surface subsequently flooding into drainages.

3. Water Well Mitigation

The Water Well Mitigation Agreement as currently laid out in the EIS, does not provide long term protection or compensation for adverse impacts to landowner wells after the completion of the CBM project, or for as long as the affected aquifer remains in a depleted state.

4. Land-owner Compensation and Mitigation

The EIS falls short in defining specific mitigation plans to compensate landowners if there is surface damage caused by methane seeps, underground coal fires, failure of reclamation efforts, and stream flooding.

In summary, the above items represent significant concerns and should be addressed in the EIS.

Thank you for your consideration of these matters.

Sincerely,

Kathy Moriarty

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[illegible]

BUREAU OF LAND MANAGEMENT
JUN 2 2 [illegible]

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Office of Federal Land Policy

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WYOMING
GAME AND FISH DEPARTMENT
"Conserving Wildlife — Serving People"

June 14, 1999

WER 8022
Bureau of Land Management
Buffalo Field Office
Draft Environmental Impact Statement
Wyodak Coal Bed Methane Project
State Identifier Number: 99-130

2
BUFFALO FIELD OFFICE
BUFFALO, WY

Wyoming State Clearinghouse
Office of Federal Land Policy
ATTN: Julie Hamilton
Herschler Building, 3SW
Cheyenne, WY 82002

Dear Ms. Hamilton:

The staff of the Wyoming Game and Fish Department has reviewed the Draft Environmental Impact Statement for the Wyodak Coal Bed Methane Project from the Buffalo Field Office. We offer the following comments.

Terrestrial Considerations:

Cumulative Impacts and Mitigation: Positive and negative cumulative impacts should be more thoroughly addressed. For instance, many species will benefit from the increased availability of surface water and flows in drainages. Negative impacts such as displacement and loss of habitat over the large field development area may also occur. This is particularly true for species with large home ranges, such as sage grouse, raptors, and big game, and in seasons of the year when disturbance can be detrimental, such as during nesting or parturition. Mitigation of possible cumulative impacts of this large project area should be addressed.

Some specific comments follow.

1. **Power lines:** All power lines should be built to protect raptors from accidental electrocution, according to guidelines in the following publication:

   Avian Powerline Interaction Committee. 1996. Suggested practices for raptor protection on powerlines - the state of the art in 1996. Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

Ms. Julie Hamilton
June 14, 1999
Page 2 - WER 8022

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BUFFALO FIELD OFFICE
BUFFALO, WY

Also, power line corridors should avoid wetlands to reduce the chance of waterfowl hitting the lines.

2. **Wetlands:** It is assumed that many small ponds or wetlands would be built during field development. In general, consolidating several small ponds into one larger pond would provide more open water and a longer shoreline at one site, and may be more beneficial to wildlife. Larger ponds may also have the characteristics needed to support a fishery.

   Fencing of wetlands and providing off-site watering for livestock would allow vegetation development and maintenance of water quality in key wetlands, which would benefit several species of wildlife. If fences are used, they should be placed well back from the wetlands to prevent waterbird mortalities, and should be built to the minimum standards to allow big game movement.

   If possible, wetlands and ponds should be built on accessible public land where recreational users can benefit from the development.

3. **Seasonal impacts to wildlife:** It should be noted that the appropriate standard seasonal stipulations for raptors, sage grouse, and big game will be applied.

4. **Roads:** Because of the expected number of roads that would potentially be developed, roads should be constructed to the minimum standard needed, so that disturbance to soil and vegetation on each road would be minimized. Fences along service roads should be avoided unless absolutely necessary, in order to prevent a source of barriers to big game movements. Fences should be constructed to minimum standards to avoid big game entanglements.

Aquatic Considerations:

As mentioned in our comments dated March 23, 1999 relative to the potential benefits of discharged water to fish and wildlife, we believe a more complete review of this, including legal and administrative issues, should be completed for inclusion in this Environmental Impact Statement.

Other Specific comments include:

WILDLIFE AND FISHERIES (pages 3-37 to 3-40): There is no mention in this section of reptiles and amphibians which inhabit the area and may be impacted by the proposed project. This applies to Chapter 4 as well. This information should be included in this document.

Page 3-40: *Ameiurus* is misspelled. *Platorynchus* is misspelled.

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Ms. Julie Hamilton
June 14, 1999
Page 3 - WER [illegible]

Table 3-16, page 3-43: The genus for the flathead chub is incorrect. The correct scientific name is *Platygobio gracilis*.

APPENDIX B, STANDARD "CONDITIONS OF APPROVAL" FOR APDS, Water Management: -- Development of reservoirs on natural stream courses could severely impact native aquatic species and their habitats. We recommend reservoirs developed as part of coal bed methane activities be sited in the uplands unless it can be shown they will provide benefits to fish and wildlife resources. Reservoirs could be allowed on stream courses (perennial, intermittent or ephemeral) if approved by this Department as providing such benefits. This condition is consistent with recommendations we have made to the Corps of Engineers relative to GP98-08.

Thank you for the opportunity to comment.

Sincerely,

Bill Wichers

BILL WICHERS
DEPUTY DIRECTOR

BUREAU OF LAND MANAGEMENT
JUN 22 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

BW:TC:as
cc: USFWS

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WYOMING STATE GEOLOGICAL SURVEY
P.O. BOX 3008 • LARAMIE, WYOMING 82071-3008
[illegible] • FAX [illegible]
E-MAIL: [illegible] • WEB: [illegible]
STATE GEOLOGIST - Lance Cook

June 17, 1999

BUREAU OF LAND MANAGEMENT
JUN 22 1999
BUFFALO FIELD OFFICE
BUFFALO WY

MEMORANDUM

TO: Julie Hamilton, Wyoming State Clearinghouse

FROM: Lance Cook, P.G., State Geologist

SUBJECT: Wyodak Coal Bed Methane Project DEIS
(State Identifier # 99-130)

There is a well documented seismic history for the Powder River Basin, and the Section has completed a basic seismological characterization for the area. In addition, landslides have been recently mapped. If this data should be discussed in this document, the Geological Survey can supply it.

There are some unresolved issues with selenium in the report. Water analyses referenced on pages 3-14, 3-20, and 3-22 usually are compared to standards for human consumption, livestock consumption, or irrigation. In these cases, the selenium levels appear to be acceptable. The US Fish and Wildlife Service has indicated that levels as low as 5 ppb can cause adverse effects in fish and waterfowl. This is especially important if any wetlands, ponds, or lakes may be formed or expanded as a result of the increased water discharge.

The Tongue River Member is not generally classified as an aquitard (Feathers, K.R., Libra, R., and Stephenson, T.R., 1981, Occurrence and characteristics of ground water in the Powder River Basin, Wyoming: Wyoming Water Resources Research Institute report to EPA, Contract Number G-008269-79). Unless the BLM has site specific data to the contrary, they may want to consider modifying the paragraph on the Tongue River/Lebo Aquitard on page 3-22.

The Abandoned Coal Mine Lands Research Program at the University of Wyoming has funded a project titled "Determination of Contribution to Cumulative Groundwater Impacts from Coal Bed Methane Development and Surface Coal Mining". The principal investigators are Borgman, Kern, Peacock, Bregan, and Meyer. A draft of the report has been completed, but the final has not been supplied to the University of

Wyoming. The results of the research might be appropriate for inclusion in the Hydrogeologic Framework Section of the final EIS.

There is a possibility that coal development in this area will encounter uranium mineralization. We request a notation that should this occur, the operator should contact the Industrial Minerals and Uranium Section of the Wyoming State Geological Survey.

JUN 22 1999

The area of proposed action includes outcrops of Eocene Wasatch Formation and Paleocene Fort Union Formation, both of which have yielded significant mammalian fossils, as well as reptiles, plants, fish, etc., in the Powder River Basin. This potential should be addressed and appropriate steps recommended for protection of any fossil resources uncovered during the coalbed methane drilling and development in the area.

The geology section of the document should reference the new 1:100,000-scale geologic map of Gillette Quadrangle (MS-49) by the Wyoming Geological Survey. It is the most recent geologic map of the area and contains references to more detailed maps. Maps referenced by the DEIS are earlier, less detailed maps.

In the Socioeconomics section (p. 4-114 to p. 4-126), State royalties are calculated using a 12.5 percent rate. Most of the State coalbed methane leases require a royalty rate of 16 2/3 percent. Another incorrect assumption is that State severance taxes and County ad valorem taxes are only paid on production from fee wells. State severance and County ad valorem taxes are paid on all wells. There is a deduction from these taxes on State and Federal wells for State or Federal royalties. The net result of these mistakes is to understate the economic benefits of this project to the State and local governments.

On p. 3-6 the Mowry Shale is listed as Lower Cretaceous. The Mowry Shale is now considered Upper Cretaceous.

On Table 3-20, Wyoming valuation under Other Minerals should be 293 million rather than 293 billion.

On page 3-51 the second paragraph the authors list the active mines in the area. To put this in agreement with later discussion, such as table 4-15, several names should be altered. Caballo is now known as Caballo-Rocky Butte. North Antelope-Rochelle operates now as a mine complex similar to Cordero-Rojo.

Also on page 3-51 paragraph 4, the study area has two not one major railroads. The Burlington Northern/Santa Fe and the Union Pacific are separate

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railroads. Although they share parts of joint lines in portions of the study area, they also have their own lines in the area.

Paragraph 3 page 4-3 raises some concerns for coal mines in the area. "Development of CBM wells would be precluded in areas of active or impending coal mining. Locating wells in areas where future mining may take place would preclude mining during the life of wells located in the proposed mining area." This is very cloudy in respect to what impending means. Is this based on a mine's twenty-year mine plan or some other time frame? A little more discussion on mining & CBM conflicts might be warranted, particularly in light of the Supreme Courts ruling in Amoco vs. Ute Tribe and the explicit wording of the Court's decision regarding incidental venting of methane during mining operations. Resolution of this conflict prior to the final EIS decision is very important.

Page 4-31 first Paragraph, the earliest surface mining along the Wyodak Roland outcrop besides the Wyodak mine (1925-present) included six or seven small surface mines active between 1930 to 1974. Although, by today's standards, their output was small, they were active. Modern large surface mines not including the Wyodak mine started in 1972 (Belle Ayr), not 1975 as stated. Also, the presently anticipated end of mining in year 2021 is not accurate. Current remaining reserves are sufficient for many mines to be in operation for many years after 2021. The data does not recognize the fact that most operations are now producing coal under 200 feet of overburden, while the next generation of mines will probably remove upwards of 300 feet of overburden, which conservatively keeps the operations going for an additional 20 to 30 years.

Table 4-15 under permitted coal production has some numbers different to those we got in the past month from Wyoming DEQ. Some of these should be rechecked. The differences we show are as follows:
1.Buckskin 23.0 versus 24.0 as shown on Table 4-15.
2.Caballo 35.0 versus 51 as shown on Table 4-15 (the difference may be related to combination of Caballo with Rocky Butte?).
3. Ft Union 3.7 plus KFx 0.6 = 4.3 versus 9.4 as shown on Table 4-15.
4. Wyodak mine 9.2 versus 10 as shown on Table 4-15.
5. North Antelope/Rochelle 67 versus 65 as shown on Table 4-15.
6. North Rochelle 12.5 versus 20 as shown on Table 4-15.
The above numbers would bring the total permitted capacity down to 447.0 from 475.4 as shown on Table 4-15.

There is a statement on p. 2-24 that APDs for up to 400 Federal wells could be approved by BLM in a given year. We understand the BLM will be able to process more than 400 APDs per year in light of passage of the emergency spending bill by Congress, which allocates an additional $1 million for processing coalbed methane permits in Wyoming.

BUREAU OF LAND MANAGEMENT
JUN 22 1999

We are curious as to why Alternative 1 is not the Proposed Action, since it takes in a larger area and includes development that is proposed or ongoing. The Geological Survey supports Alternative 1 as the preferred alternative, as it will provide less hinderance to the timely development of the CBM resource.

BUREAU OF LAND MANAGEMENT
JUN 22 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

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State Engineer's Office

Herschler Building, 4-E Cheyenne, Wyoming 82002
(307) 777-7354 FAX (307) 777-5451
[illegible]

JIM GERINGER
GOVERNOR

GORDON W. FASSETT
STATE ENGINEER

Memorandum

BUFFALO FIELD OFFICE
JUN 22 1999
BUFFALO, WY

Date: June 18, 1999

To: Julie Hamilton, Wyoming State Clearing House
Office of Federal Land Policy

From: Richard G. Stockdale, Administrator
Ground Water Division

Re: Review of Draft Environmental Impact Statement for the Wyodak Coal Bed Methane Project (State Identifier No. 99-130)

My specific comments on the subject Draft EIS are listed by chapter, page and paragraph.

1-8: Paragraph 4 should be modified to read as follows:
The State of Wyoming considers water produced in conjunction with CBM development to be a beneficial use of ground water, and requires an approved permit from the Wyoming State Engineer's Office (WSEO) prior to the drilling of a CBM well. Stream channel modification, reservoir supply, construction of new reservoirs and/or dam modification on existing reservoirs also require permits from the WSEO.

2-16: Paragraph 5
The following statement regarding the indication of impacts to two (2) wells, "This would occur if water levels drop below the lowest point of diversion in the vicinity of the well and well yields are reduced below historic production levels," is NOT correct. Neither well yields or water levels are guaranteed by a water right. A determination would have to show that CBM development is interfering with historic permitted usage of water.

2-17: Specific Monitoring Activities: Groundwater: Items 1 & 2
- Baseline static water levels, production capacity, and methane concentration: for all properly permitted water wells.....
- Periodic monitoring of static water levels in CBM productions wells as required by WSEO.

Reports are required to be submitted to the WSEO monthly. Current WSEO monitoring requirements are different than those listed in the DEIS. Enclosed is a copy of present WSEO Additional Conditions and Limitations attached to CBM well permits.

2-18: Surface Water: Item 1
- Monitoring of volume of produced water being discharge to the surface as required by WSEO under Conditions and Limitations specified under for each ground water permit, by the WDEQ under the terms specified in each NPDES permit, and as required by the WOGCC for surface flows encountered during drilling.

2-22: Injection of Produced Water Underground
In this section only the disposal of produced water to non-potable aquifers was considered. Consideration should be given to injecting produced CBM water to the Lower Ft. Union Formation aquifers in the Tullock Member. The City of Gillette has conducted a short term feasibility study with very encouraging results. (See Wester-Wetstein Association report to the City of Gillette, April 20, 1999.)

3-10 and 3-13
3-10 says 66% to Belle Fourche but 3-13 says 77%. Which is correct?

4-8 and 4-12: Water Flow
The following two (2) statements appear to conflict on the number of discharge points.
4-8: "Water would be discharged from an estimated 500 - 1,000 locations" (?) NPDES discharge points)

4-12: "Approximately 2,500 discharge points will be utilized to implement the Proposed Action."

4-8: Paragraph 2
The last sentence says "velocity would decrease as slopes drop." The word "drop" is ambiguous.

4-8
Total conveyance losses at project boundary are stated to be 23-56% which doesn't line up with 3-10. 3-10 estimates used the Board of Control "rule of thumb" of 1% loss per mile everywhere. This is probably incorrect for dry draws or intermittent stream channels.

4-123
Discussion of water flow to Sakakawea is confusing since most flows into the Belle Fourche River drainage and tributaries of the Cheyenne River flow to Oahe Reservoir.

4-123
The use of average flows into Keyhole Reservoir, etc., are not too valuable since the "average" year rarely, if ever, occurs.

4-124
First sentence says, "... 4,000 acre-foot point..." Keyhole Reservoir is approximately 4,000 acres in size, not 4,000 acre-feet.

As a general comment, the State Engineer's Office recognizes that any predictive hydrologic modeling effort is only as good as the input data. It seems that some of the input data utilized in the Draft EIS is based upon assumptions that may not represent the "real world" conditions. Because of this, a monitoring system of sufficient magnitude needs to be created to act as an early warning system for all of the various environmental parameters that could be affected by CBM development.

If you have questions, please feel free to contact me.

enc.

BUREAU OF LAND MANAGEMENT
JUN 22 1999
BUFFALO FIELD OFFICE

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PERMIT NO. G.D. ____________

PERMIT GRANTED

AP 22 [illegible]

Priority Date: ____________ Approval Date: ____________

ADDITIONAL CONDITIONS AND LIMITATIONS

The right to withdraw ground water under this permit to facilitate the production of natural gas is hereby granted subject to the following additional conditions and limitations:

1. The permittee or the permittee's successors or assigns shall, at its own expense, install and maintain on each production well such meter(s) or other measuring devices as may be required and approved by the State Engineer.

2. A written monthly report shall be submitted to the State Engineer during the first ten (10) days of each month following the reporting period by permittee, or the permittee's successors or assigns, stating the following information:
   a) Well name, State Engineer Permit Number, well location
   b) Reporting period dates, the name of the individual responsible for the report, method of measurement (i.e. [illegible], etc.)
   c) Total volume of water produced during the reporting period, total cumulative volume of water produced since reporting began, total volume of natural gas produced during reporting period and total cumulative volume of natural gas produced since reporting began.
   d) [illegible]

   The State Engineer may change the written report period if the permittee, or the permittee's successors or assigns, submits a written request to do so, or if the State Engineer determines that a change in the reporting period is necessary and desirable.

3. The State Engineer and any of his duly authorized agents or employees shall have the right at any and all times during the life of the permit and at the State's own expense, to run or conduct such independent tests and inspections as the State Engineer may require.

4. This well shall be cased with [illegible] casing and cemented from the surface of the ground to the top of the zone from which methane is to be produced. A cement bond log may be required to determine cement distribution.

5. The permittee, or the permittee's successors or assigns, shall be responsible for measuring and reporting to the State Engineer the ground water level in nearby water wells mutually agreed to by the State Engineer and permittee of this well every six (6) months. The report shall be submitted to the State Engineer by July 31 and January 31 of each year stating the ground water level measurements obtained during the previous six (6) month period, the owners name, well name, location and State Engineer permit number if available.

6. The granting of this permit creates no obligation either express or implied for the State Engineer to grant any additional permits associated with this project.

7. The permittee, or the permittee's successors or assigns, may submit a written request asking for modification of these conditions and limitations.

8. This permit will be reviewed in five (5) years from the date of approval.

9. Part I of the Proof of Appropriation and Beneficial Use of Ground Water is required under this permit, however, Parts II and III are waived.

10. The conditions and limitations of the permit are binding upon any and all successors and assigns of the permittee.

11. The permit granted herein is subject to all other applicable requirements of State law not herein specifically stated.

DATE ____________ ____________

GORDON W. FASSETT, State Engineer

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BUREAU OF LAND MANAGEMENT
JUN 23 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

June [illegible], 1999

Richard Zander

Bureau of Land Management

1425 Fort Street

Buffalo, WY 82834

Dear Mr. Zander:

I wish that my name, address, city, state, etc. be kept confidential.

In reviewing the Wyodak Coal Bed Methane Project Draft Environmental Impact Statement I have developed the following suggested changes:

Chapter 2, Page 2-11, Well Production Facilities

Suggested Change

A downhole pump and electronic pressure sensor will be utilized to produce water from the uncased open hole interval ....

Chapter 2, Page 2-14, Produced Water-Gathering System and Discharge Facilities

Suggested Change

... NPDES permits within the project area. In accordance with WDEQ all discharge points will have continuous flow monitoring.

Chapter 2, Page 2-26 & 27, Hydrologic Monitoring and Mitigation

Suggested Change

This information will be greatly supplemented when all monitoring information being gathered by operators is brought into one common database.

Chapter 2, Page 2-27, Hydrologic Monitoring and Mitigation

Suggested Change

... but until this work is completed no new APDs will be issued.

Chapter 2, Page 2-27, Specific Monitoring Activities, Groundwater

Suggested Change

... by the Water Well Agreement in Appendix B. A static water level is defined as data obtained from the bottom of the hole pressure sensor taking recorded readings of not less than every 5 minutes. The well will not achieve a static condition until such a time as the bottom of the hole pressure does not increase more than 1 psi in a 1 hour period.

Chapter 2, Page 2-27, Specific Monitoring Activities, Groundwater

Suggested Change

Periodic monitoring of static water levels in CBM production wells as required by the WOGCC. Based on current WDEQ requirements, it is expected that the WDEQ will require the operator to submit monthly reports containing the following information in addition to static water level measurements for each CBM well.

Chapter 2, Page 2-28, Specific Monitoring Activities, Groundwater

Suggested Change

Periodic spot checking of measurements made by operators not using third party data collection on their monitoring wells. The CBM operator will be charged for the spot check.

Thank you for this opportunity to participate in your EIS. I would be happy to answer any questions that you may have concerning my suggested changes. I will state again, I wish that my name, address, city, state, etc. be kept in confidence.

Thank you.

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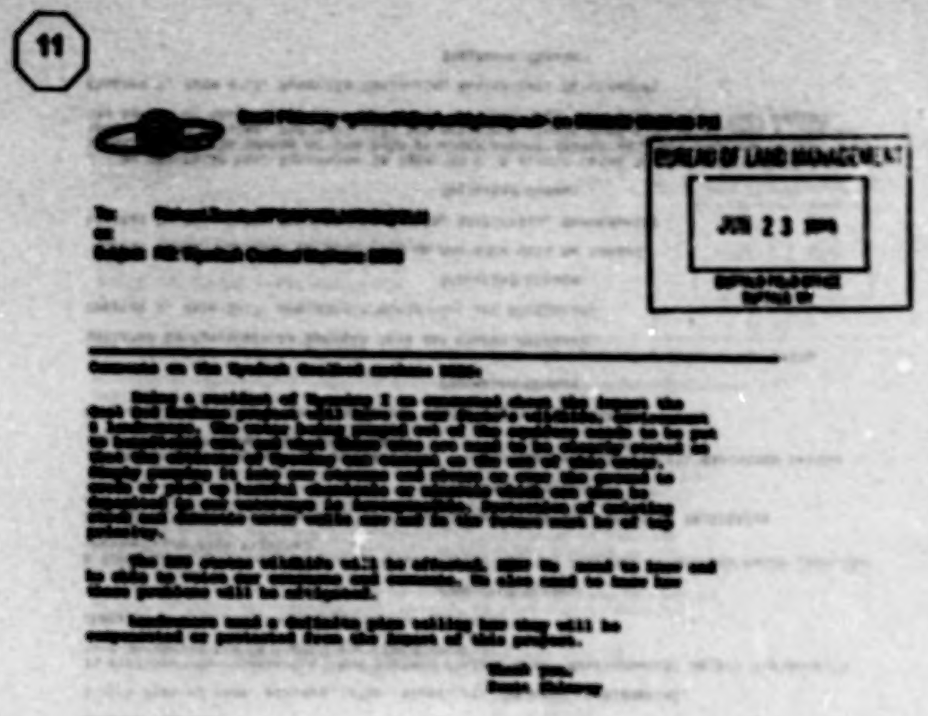

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BUREAU OF LAND MANAGEMENT

JUN 2 3

To:

Subject:

Thank you,

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SCIENTIFIC GEOCHEMICAL SERVICES

P.O. Box [illegible]
Casper, WY [illegible]

(307) [illegible]
FAX [illegible]-1113

BUREAU OF LAND MANAGEMENT
JUN 24 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

June 22, 1999

Mr. Richard Zander
Bureau of Land Management
1425 Fort Street
Buffalo, Wyoming 82834

Re: Comments on the Draft Environmental Impact Statement (DEIS) for the Wyodak Coalbed Methane Project.

Dear Mr. Zander:

On June 2, 1999, I had the opportunity to visit with Messrs. Ed. Heffern (Geologist), Mel Schlagel (Regional Coal Coordinator), and Ms. Vickie Miranda (Geologist) all of the U.S. Department of the Interior, Bureau of Land Management (BLM), Wyoming State Office in Cheyenne Wyoming. During that meeting I discussed my concerns regarding the impacts coalbed methane development is and could have on the environment. These concerns were also addressed in several letters I sent to your office dated February 9, 1999 and April 27, 1999.

I reviewed the DEIS and continue to be concerned that adequate thought and science have not been given to the potentially disastrous environmental damage resulting from the "run-a-way" coalbed methane program. The DEIS has acknowledged problems such as methane venting, loss of water wells, loss of vegetation, confined flow, aquifer collapse (with subsequent recharge uncertainty) and others that are and may continue to occur but offer very limited (if any) assurances that these problems will be completely resolved. By merely identifying the potential problems that are and will occur is simply not enough care for public land.

The excessive amounts of water removed from the coalbeds present both surface and subsurface problems. As stated in my previous letters to your office and recently to the BLM employees in Cheyenne, management of the produced water at the surface is a monumental task. Equally as important but more complex is understanding the effects the dewatering has on the subsurface. Soil (reservoir) collapse, water level decline (well loss), methane venting, confined flow, and other problems are occurring or will occur and will surely intensify over the 10 to 20 year life of the coalbed metha[illegible]gram.

Soil (reservo[illegible]apse and recharge complications.

In parts of the United States surface elevations have been lowered as much as 13 feet due to the removal of vast amounts of subsurface water for irrigation purposes. After the collapse (subsidence) of the reservoir, it is impossible to recharge the system. The aquifer is permanently damaged. The DEIS states that "overpumping of water from the coal could shut off methane flow if the coal structure collapses," (page 3-[illegible]). Collapsing (subsidence) of the coal and/or shallow aquifers is a real possibility resulting in surface damage (slumping, etc.) as well as recharge complications.

Water level decline (well loss) & methane venting.

Removal of water from the coalbeds has resulted in water wells going dry. Mitigation between the well owner and the operator generally results in a new and most likely deeper well. The lost well is reflecting the lowering of water levels not only in the well but also nearby. Reservoir collapse, recharge complications, methane venting, and coal fire potential are more widespread than just near the lost well.

Recently, I visited a ranch located approximately 25 miles south and 5 miles east of Gillette, Wyoming where a domestic well began flushing and hissing. The well did not have a past history of this type behavior. Copious amounts of methane are venting from the well. A methane fire at the well head destroyed the well's electrical system. The soil near the well contains elevated levels of methane. The well is now useless. The land owner may be in danger if methane collects in the ranch house basement or elsewhere and is accidentally ignited. Coalbed methane operations surround this ranch.

I have visited several other ranches where coalbed methane operations are ongoing and water wells have been impacted.

I have also visited areas where water wells are "gassy" and coalbed operations have not yet begun. These places represent sites where the balance of natural forces (water and gas) are somewhat at equilibrium. A slight shift in either direction (i.e., more groundwater or less groundwater) could sway this balance. These sites should be "Red Flagged" as these most likely to be adversely

BUREAU OF LAND MANAGEMENT
JUN 24 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

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June 26, 1999

Richard Zander
Bureau of Land Management
1425 Fort Street
Buffalo, WY 82834
email: richard_zander@blm.gov

Dear Mr. Zander:

I wish that my name, address, city, state, etc. be kept confidential.

In reviewing the Wyodak Coal Bed Methane Project Draft Environmental Impact Statement I have developed the following suggested changes:

Chapter 2, Page 2-11, Well Production Facilities

Suggested Change

A downhole pump and electronic pressure sensor will be utilized to produce water from the uncased open hole interval ....

Chapter 2, Page 2-14, Produced Water-Gathering System and Discharge Facilities

Suggested Change

... NPDES permit within the project area. In accordance with WDEQ all discharge points will have continuous flow monitoring.

Chapter 2, Page 2-16 & 17, Hydrologic Monitoring and Mitigation

Suggested Change

This information will be greatly supplemented when all monitoring information being gathered by operators is brought into one common database.

Chapter 2, Page 2-17, Hydrologic Monitoring and Mitigation

Suggested Change

... but until this work is completed no new APDs will be issued.

Chapter 2, Page 2-17, Specific Monitoring Activities, Groundwater

Suggested Change

... by the Water Well Agreement in Appendix D. A static water level is defined as data obtained from the bottom of the hole pressure sensor taking recorded readings of not less than every 5 minutes. The well will not achieve a static condition until such a time as the bottom of the hole pressure does not increase more than 2 psi in a 5 hour period.

Chapter 2, Page 2-17, Specific Monitoring Activities, Groundwater

Suggested Change

Periodic monitoring of static water levels in CBM production wells as required by the WOGCC. Based on current WOGCC requirements, it is expected that the WOGCC will require the operator to submit monthly reports containing the following information in addition to static water level measurements for each CBM well:

Chapter 2, Page 2-18, Specific Monitoring Activities, Groundwater

Suggested Change

Periodic spot checking of measurements made by operators not using third party data collection on their monitoring wells. The CBM operator will be charged for the spot check.

Thank you for this opportunity to participate in your DEIS. I would be happy to answer any questions that you may have concerning my suggested changes. I will state again, I wish that my name, address, city, state, etc. be kept in confidence

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devon
ENERGY CORPORATION

20 North Broadway, Suite 1500
Oklahoma City, OK 73102-8260

Telephone 405/235-3611
Fax 405/552-4550

June 22, 1999

Certified Mail
Return Receipt Requested

BUREAU OF LAND MANAGEMENT
JUN 25 1999
BUFFALO FIELD OFFICE
BUFFALO WY

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

RE: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement - May 1999

Dear Mr. Zander:

Following are the Devon Energy Corporation (Nevada) comments on the subject DEIS:

1. At various places in the DEIS, a comment is made regarding the potential for methane migration into water wells.

   - Methane is valuable to producers and, ultimately, the public. Therefore, it is incumbent upon each operator to assure methane recovery is optimized for eventual sale.

2. Page 2-11, top paragraph, "A downhole pump will be utilized to produce water from the uncased open hole interval located below the steel production casing."

   - This statement implies that a downhole submersible-pump is the only method to be utilized on all wells. In some situations, another suitable method may be more economic and efficient than a downhole submersible-pump. We recommend that this issue be left open to evolve with the play.

3. Page 2-16, third complete paragraph, "If no water well falls within the initial COI, the COI would be expanded to the next nearest water well."

   - We recommend this sentence be changed to read:

     "If no water well falls within the initial COI, the COI would be expanded to the next nearest permitted water well, not to exceed one mile."

     We recommend this change because industry standards by most government agencies with oversight responsibility are 1/2 to 1 mile.

BUREAU OF LAND MANAGEMENT
JUN 25 1999
BUFFALO FIELD OFFICE
BUFFALO WY

   - We are not aware of water wells that have not been permitted. Water wells outside our recommended distance limitation are not likely to be impacted by CBM activity.

4. Page 2-17, third bullet on the bottom of the page, "Based on current WSEO requirements, it is expected that the WSEO would require the operator to submit monthly reports containing the following information in addition to static water level measurements for each CBM well:"

   - What is the definition of static water level?

   - This requirement will result in a significant amount of unnecessary information and substantial burden to field operations. We recommend that the bottomhole-pressure reporting be reduced to a maximum of one well per month per township. This will still provide sufficient information to monitor de-watering and aquifer pressure on a regional basis. Also, this would relieve the BLM, operators and other governmental agencies of a huge administrative burden. It would be virtually impossible for the BLM and each governmental agency to monitor static-pressure data from thousands of CBM wells each month. For field operations, the suggested change would relieve a huge operational burden and provide for more consistent field operations. Under the draft proposal, the operators will experience great losses in production and reduced de-watering efficiency. For example, a well that produces 300 MCFD would lose 800 mcf in production in one year if shut-in 8 hours each 45 days. If an operator has 1000 wells, the total lost production approaches nearly 1 bcf. Finally, the burden on operations is significant. For example, for a 100-well program, an operator would have at least two wells shut-in every day. For a 1000-well program, an operator would have over 20 wells shut-in at any one time. Cycling wells in this fashion will result in more trips to the well than we believe is appropriate on a two track road system. During times of poor weather conditions, it is impossible to reach some locations even with a 4x4 vehicle. If we are forced to shut-in wells as frequently as stated, we will experience rutting conditions, stuck vehicles, and extensive road repairs. As an operator, we are trying to limit the number of trips we make to each well. We strongly recommend that this requirement be reconsidered and changed.

5. Page 2-20, top paragraph, "In coordination with the WSEO, an adequate number of monitoring wells would be added to the existing monitoring wells that were established previously as part of the Gillette North CBM Project EA and Gillette South CBM Project EIS assessment and decision process (Table 2-4)."

   - A sufficient number of monitoring wells already exist.

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JUN 25 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

6. Page 4-14, bullet #4, "Alternate discharge points will be utilized, as appropriate, to minimize spring flooding of fields or to provide for other seasonal use."

   - Since all discharge points must be permitted in NPDES permits and monitored regularly (including water quality sampling), why would alternate discharge points be required?

7. Page 4-14, bullet #6, "Existing downstream culverts may need to be replaced with larger sizes to handle new flows. New culverts will need to be sized considering total flows." and page 4-15, bullet 5, "Downstream impoundments may need new or redesigned outlet works in order to handle the steady inflow provided by CBM discharge water."

   - How far downstream must this be analyzed? Who will be asked to do this? Under what authority will the request be made?

8. Page 4-14, bullet #7, "Discharges will be limited to a volume less than or equal to the naturally occurring mean annual peak flow that can be handled by the channel cross-section under anticipated conditions, including flood events such as the 2-year 24-hour storm."

   - Some drainages have near zero mean annual peak flow, especially the Belle Fourche drainage basin. How would CBM flows be discharged at all in these areas, even for a single well? The third bullet on page 4-14 provides all information needed for produced water discharges. The wording as quoted above should be changed to say the same as the third bullet on page 4-14, or eliminated.

9. Page 4-15, bullet #7, last sentence, "River monitoring plans will be developed in consultation with the USGS and the BLM."

   - Will the operators be asked to do this? Why is it necessary?

10. Page 4-15, bullet #10, "Reclamation must produce a natural appearance and must be consistent with site conditions, area management standards, and projected uses, as agreed upon by the operator, landowner or lessee, and appropriate state and federal agencies."

    - This bullet should be worded: "Reclamation is intended to restore the condition of the disturbed area as practicably as possible to its condition before the disruption."

11. Page B-1, top paragraph, "Not all of the mitigating measures in this second section are applicable to coal bed methane development."

    - Which mitigating measures in the second section are applicable to coal bed methane development?

BUREAU OF LAND MANAGEMENT
JUN 25 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

12. Page B-2, last bullet on the page, "Cumulative discharge must not exceed the naturally occurring, mean annual peak flow of the receiving channel."

    - Some drainages have near zero mean annual peak flow, especially the Belle Fourche drainage basin. How would CBM flows be discharged at all in these areas, even for a single well? The third bullet on page 4-14 provides all information needed for produced water discharges. The wording as quoted above should be changed to say the same as the third bullet on page 4-14, or eliminated.

13. Page B-4, under "Monitoring Plans," fourth bullet, "Downstream channel (below the well(s)/(project) will be inspected for signs of accelerated erosion due to the continuous flow of produced water."

    - Who is responsible for the inspection?

14. Page B-6, #5, "A flare pit will be constructed on the well pad for use during drilling operations. It will be located at least 125-feet from the well head and will be located downwind from the prevailing winds."

    - A flare pit is generally constructed for a conventional well. CBM wells will not have flare pits.

15. Page B-6, #7, "The reserve pit will be lined with an impermeable liner if permeable subsurface material is encountered."

    - This will be fresh water. There is no need for a liner.

We appreciate the opportunity to comment on the DEIS.

Sincerely,

G. N. Matlock, P.E.
Manager, Environmental, Industrial Hygiene & Safety

GNM/lce

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[redacted] [illegible]

To: [illegible]
cc:
Subject: EIS for WYODAK Coal Bed Methane Proj.

Neil G. and Jennifer S. Miller
P.O. Box [illegible]
[illegible], WY [illegible]

[illegible]
BLM Buffalo Field Office
[illegible]
Buffalo, WY [illegible]

Dear BLM Managers,

[illegible]

[illegible]

Please curtail this project as Wyoming's water and wildlife is worth much more than methane gas to the people of Wyoming.

Sincerely,

Neil G. and Jennifer S. Miller

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16

[illegible] on [illegible]

BUREAU OF LAND MANAGEMENT
28 [illegible]
[illegible]

To: [illegible]
cc:
Subject: Wyodak CBM EIS comments

Dear sir,

I am entering these comments in regard to the Draft Wyodak CBM EIS. I do not believe that there has been an adequate length granted for the comment period. The projected life of this [illegible] project is [illegible] years and yet the public is allowed less than 60 days to comment. The comment period must be extended.

Because there are numerous issues and not much time I will comment specifically on several points.

1. [illegible]

[illegible]

[illegible] wells could be [illegible] in a given year. What is this based on?

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

This is a very abbreviated list of concerns I have. I have attached a letter which I wrote to Governor Geringer with a variety of concerns. I request that it be included as part of my comments.

I thank you for your time and consideration. I sincerely look forward to a longer comment period and your response to my concerns.

Sincerely,

[redacted] [illegible]
-gov_ops

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17

Wildlife Management Institute

Len H. Carpenter, Field Representative
4015 Cheney Drive • Fort Collins, Colorado 80526
Phone (970) 223-1099 • Fax (970) 204-9198
[illegible]
[illegible]

ROLLIN D. SPARROWE
President
LONNIE L. WILLIAMSON
Vice-President
RICHARD E. McCABE
Secretary

BUREAU OF LAND MANAGEMENT
JUN 28 1999
[illegible]

June 24, 1999

Richard Zander
BLM Buffalo Resource Area Office
1425 Fort Street
Buffalo, WY 82834

Dear Mr. Zander:

I am the Southwest Field Representative for the Wildlife Management Institute. The Institute is a private, nonprofit, scientific and educational organization founded in 1911 and dedicated to the restoration, conservation, and sound management of natural resources, especially wildlife, in North America. I have the following comments on the DEIS for coal bed Methane Development Projects in Campbell and Converse Counties, Wyoming.

First of all, I am concerned and disappointed in your choice of alternatives. Alternatives in a DEIS should be broad enough to allow for reasonable decision space. In this DEIS, there is the proposed action (5000 wells), one alternative (expanded project area) with 2000 more wells, and the no action alternative. Why is there not an alternative that analyzes the pros and cons of a reduced project area? In Chapter 2, you outright dismiss an alternative that would reduce the number of federal wells to no more than 1500 by saying that the flexibility in the implementation of the Proposed Action will handle that possibility. This approach violates the purpose of developing viable alternatives in NEPA documents. A wide range of alternatives and their analyses better informs the public(s) and decision makers of expected impacts. It should not be the role of the agency to decide this before hand. In the search for a creditable document I urge the BLM to consider adding a reduced project area alternative in the FEIS. If this is not done, the FEIS must justify with more than a sentence or two and providing documentation on how the Proposed Action can hold well development below 1500.

In the scoping comments I raised the issue of the validity and currency of the biological data used in the DEIS analysis for wildlife and fisheries resources. The DEIS only heightens my concerns. Given that nearly 17,000 acres of terrestrial wildlife habitat will be affected during the life of the project it is important that data used for the analysis of impacts on terrestrial species be as valid and relevant as possible. Chapter 4 presents the environmental consequences of the selected alternatives. Compared to other DEIS documents that I review, this chapter is grossly inadequate. A good example of the inadequacy is on page 4-37 in the paragraph on upland birds. It is stated "numerous grouse leks have been identified with the project area." What kind of information is this? Undoubtedly, the grouse referred to is sage grouse. Given the concern for sage grouse throughout their range at this time, it is surprising that this document seems to understate what the species is and what the expected impacts will be. My point is that this kind of document preparation is [illegible], lax, far from scientific, and highly questionable in value. This same kind of generally [illegible] individual wildlife species is spread throughout the chapter on environmental consequences. The DEIS does not reveal the source or currency of any of the information. I request that this sloppy attention to detail be cleaned up in the FEIS. Again, it appears that the BLM is simply jumping through hoops and is ensuring neither the intent nor spirit of NEPA documentation.

At what point does the density of development (wells, coal fields, coal bed methane projects), reach the critical carrying capacity where it is no longer possible that the development can be managed in such a way as to provide for other natural resources and the use and enjoyment of those natural resources by people? The inherent number of roads with increased traffic levels and increased dust will seriously impact air and water quality. It is time that the BLM begins addressing cumulative impacts on some other basis than project by project.

Finally, I am concerned about the "sense of place." The natural environments of Wyoming are unique and provide habitats for a wide variety of animals. They also provide unique opportunities for the American public to enjoy the great out of doors in a variety of ways. Continued energy development at the pace described in this proposed document threatens these values. The FEIS should address this issue. At some point in the near future the BLM must acknowledge what is happening to the public lands in Wyoming and begin to limit the growth of the energy industry and the concomitant loss of other natural resources. Federal law requires that the BLM exercise its long term stewardship responsibilities in land use decision making. The BLM is not in place to simply accommodate every use that is requested.

Thanks for the opportunity for comment. Please be sure I receive the FEIS.

Sincerely,

Len H. Carpenter

Len H. Carpenter

cc:
R. Sparrowe, WMI
T. Fry, BLM, Washington, D.C.
A. Pierson, BLM
J. Emmerich, Wyo. G&F

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

BUREAU OF LAND MANAGEMENT
... 28 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

ES-61411
[illegible]

June 24, 1999

Memorandum

To: Richard Zander, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming

From: Field Supervisor, Ecological Services, Cheyenne, Wyoming (ES-61411)

Subject: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement

Thank you for providing the Draft Environmental Impact Statement for the Wyodak Coal Bed Methane Project in Converse and Campbell Counties, Wyoming. My staff has reviewed this document and we have the following comments.

Threatened and Endangered Species
The status of the mountain plover (Charadrius montanus) has been changed from candidate to proposed. In the Federal Register dated February 16, 1999, the U.S. Fish and Wildlife Service gave notice of a proposal to list the mountain plover as a threatened species pursuant to the Endangered Species Act (Act) of 1973.

ESA regulations at 50 CFR 402.10 allow for conferencing with the Service on any action the Federal agency determines may affect a proposed species, and requires conferencing with the Service on any action that is likely to jeopardize the continued existence of any proposed species. On page 7599 of the proposed rule to list the mountain plover, the Service has identified some actions that will likely trigger section 7 conferencing. We believe the proposed action qualifies as one of those actions, and consequently the BLM should determine whether the project may affect the mountain plover. If so, we ask that you coordinate with this office to discuss whether the action is likely to cause jeopardy to the mountain plover, and identify measures that would minimize or eliminate any proposed adverse effects. By doing so, the need to consult with the Service may be eliminated or the consultation process may be significantly streamlined should the mountain plover actually be listed as threatened.

Surveys for nesting mountain plovers are recommended if ground disturbance (wells, roads, pipelines, etc.) of the proposed project occurs between May 1 and June 30. If the mountain plover is listed during the project and an effect is likely, then consultation would be necessary and operations may cease until adverse effects can be addressed. Also, please recognize the mountain plover is a migratory bird protected under the Migratory Bird Treaty Act, 16 U.S.C. 703.

Additionally, we believe the BLM should commit to consultation with the Service in accordance with section 7(a) of the Endangered Species Act of 1973, as amended, on black-footed ferrets (Mustela nigripes), Ute ladies'-tresses (Spiranthes diluvialis), and the bald eagle (Haliaeetus leucocephalus). By regulation, a biological assessment must be prepared for "major construction activities" which are considered to be Federal actions significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act. The biological assessment will help determine whether informal or formal consultation under section 7 of the Act is necessary.

Migratory Birds
The DEIS states that special habitats for raptors will be analyzed site-specifically during the review of APDs or Sundry Notices. We recommend that the DEIS establish a disturbance-free buffer zone of ½ mile during the nesting season (February 1 through August 15) for all raptor species except listed threatened and endangered species and the ferruginous hawk, which should be protected by a 1 mile disturbance-free buffer zone. We can then consider modifications [illegible] buffer zones, if necessary, at the APD process level.

Additionally, the DEIS does not address burrowing owls (Athene cunicularia), a resident in prairie dog towns. There is concern that burrowing owl populations are declining. Therefore, we recommend measures be implemented to minimize impacts on this species. If take of burrowing owls or their nests appears likely, a permit from the Migratory Bird Office of the Service is needed.

Sage Grouse
Sage grouse are declining throughout their range. There are several proposed hypotheses for this decline, including development of underground energy resources. Given the high public interest in this species, we can likely expect a listing petition in the near future. If sage grouse are listed prior to completion of this project, consultation under section 7 of the Act may be necessary. Potential impacts to sage grouse from this project should be thoroughly analyzed at this time to minimize any activity which may contribute to their decline. We recommend that the ¼ mile buffer zone around a lek be changed to ½ mile to reduce the likelihood that proposed activities will disrupt breeding and nesting activities.

Water Quality
We are concerned that produced water from coal bed methane production that is discharged into shallow impoundments may not only create highly saline reservoirs or ponds as stated in the DEIS, but also may create an attractive hazard to many species of birds and wildlife through the evaporative concentration of selenium. Therefore, we recommend against storing water in closed impoundments.

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Elevated waterborne selenium concentrations have been documented in the groundwater and surface water from Campbell County and disposal of wastewater with elevated selenium concentrations into closed basins can adversely affect birds and wildlife. To protect waterfowl, shorebirds, and other wildlife from adverse effects, waterborne selenium concentrations should be 2 µg/L or less (Skorupa, J.P. and H.M. Ohlendorf. 1991. Contaminants in drainage water and avian risk thresholds. In: A. Dinar and D. Zilberman, eds., *The Economics and Management of Water and Drainage in Agriculture*. Kluwer Academic Publishers. Norwell, Massachusetts. pp. 345-368.). Waterborne selenium concentrations >3 µg/L exceed the bioaccumulation threshold for wildlife. Food organisms can bioaccumulate selenium from the water and supply a toxic dose of selenium to wildlife. The selenium concentration may not affect the health of the food organism (Lemly, A.D. 1993. Guidelines for evaluating selenium data from aquatic monitoring and assessment studies. Environ. Monit. Assess. 28: 83-100) but top level consumers in aquatic systems, such as waterfowl can readily accumulate selenium concentrations that lead to low reproduction, embryonic deformities and increased mortality (Ohlendorf, H.M., A.W. Kilness, J.L. Simmons, R.K. Stroud, D.J. Hoffman, and J.F. Moore. 1988. Selenium toxicosis in wild aquatic birds. J. Toxicol.Environ. Health. 24: 67-92.).

Cumulative Impacts
We do not believe the DEIS fully discusses all cumulative impacts of the proposed action to wildlife and migratory birds. Specifically, cumulative impacts associated with other activities such as coal mining, railroad construction, and other natural resource leases in and around the project area should be addressed more thoroughly. Additionally, the cumulative impacts of roads and pipelines to wildlife and migratory birds need to be discussed more thoroughly, particularly with respect to the number of roads, total mileage of roads, and the amount of disturbance associated with pipeline installation. The discussion should verify that excavated soils from pipeline trenches will remain within the right of way and the potential impacts associated with new transmission lines or meter stations if current facilities are not sufficient.

The DEIS does not offer any supporting information that suitable habitat for wildlife species and migratory birds adjacent to the project area is available for displaced animals. Specifically, no information has been provided on whether these areas are already occupied by these or other species which may prevent the displaced animals from successfully relocating to these areas. The DEIS should provide quantifiable data documenting that these adjacent habitats are not currently at carrying capacity for those species to be displaced by the proposed activities.

Furthermore, following surface disturbance, the lands will be reclaimed. However, for many species reclaimed areas will not be immediately available as habitat as these areas may differ significantly in vegetation composition and structure, as well as distance to disturbance, from the previously undisturbed habitat. Therefore, the significance of impacts to wildlife and migratory birds are understated and the DEIS should be revised to more accurately portray such impacts. If surveys indicate that mountain plovers are present in areas where ground disturbance is necessary, native vegetation should be planted to reestablish plover habitat.

These comments are made pursuant to the National Environmental Policy Act, the Endangered Species Act, and the Fish and Wildlife Coordination Act. Please keep this office informed of any developments or decisions concerning this project.

If you have any questions please contact Kim Dickerson of my staff at the letterhead address or phone (307) 772-2374, extension 30.

Sincerely,

Michael M. Long
Field Supervisor
Wyoming Field Office

cc: Director, WGFD, Cheyenne, WY
Nongame Coordinator, WGFD, Lander, WY

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BUREAU OF LAND MANAGEMENT
29 1999
BUFFALO FIELD OFFICE
BUFFALO WY

To: Richard Zander
BLM, Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming, 82834

Dear Mr. Zander,

I am writing to address concerns about the EIS for the WYODAK Coal Bed Methane Project. I am concerned about deficiencies in the following areas:

1.) What "beneficial use" is the discharged water being put to? As far as I know, it's just being dumped on the ground. This runs contrary to Wyoming laws;
2.) Landowner mitigation is not ensured in cases of seeps, fires, flooding, etc.;
3) What are mitigation plans for wildlife?;
4) No protection for landowners for adverse impacts to wells after the project is completed.

Wyoming has the rainfall of a desert. We can't afford to foul or waste what little water we have. Once again, developers are looking to make a fast buck and they don't care about the long-term effects on us Wyomingites.

Sincerely,

Pam Christensen

Pam Christensen
450 Idaho Avenue
Sheridan, Wyoming 82801

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Office of Federal Land Policy

[illegible]

BUREAU OF LAND MANAGEMENT
JUN 30 1999
BUFFALO FIELD OFFICE
BUFFALO WY

June 28, 1999

Richard Zander
BLM, Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834-2436

Re: Wyodak Coal Bed Methane Draft Environmental Impact Statement

Dear Mr. Zander:

Enclosed you will find comments from the Wyoming Department of Environmental Quality, Air Quality Division. Please incorporate these comments into the packet of comments sent to you on June 18, 1999 from the State of Wyoming. Thank you.

Sincerely,

Julie L. Hamilton

Julie L. Hamilton
Planning Consultant

Enclosure (1)

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THE STATE OF WYOMING

JIM GERINGER
GOVERNOR

Department of Environmental Quality

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

[illegible]

BUREAU OF LAND MANAGEMENT
30 [illegible]
BUFFALO RESOURCE AREA

June 21, 1999

Through: Julie Hamilton, Wyoming Office of Federal Land Policy

Mr. Richard Zander
USDI-Bureau of Land Management
Buffalo Resource Area
1425 Fort Street
Buffalo, WY 82834-2436

Re: Wyodak Coal Bed Methane Draft Environmental Impact Statement

Dear Mr. Zander:

The Air Quality Division (AQD) of the Wyoming Department of Environmental Quality (WDEQ) has reviewed the Draft Environmental Impact Statement and Air Quality Technical Reference Document for the Wyodak Coal Bed Methane Project. Attached you will find the Division's specific comments.

I would like to bring to your attention that the regulatory authority for mobile sources (i.e., rail, on-road, and off-road) lies with the Environmental Protection Agency (EPA) not the WDEQ-AQD. As such, questions on mobile source emissions control due to the contribution of mobile sources to the cumulative visibility impacts in the Class I and sensitive Class II areas should be directed to EPA. The Division believes that this is an important point to disclose to the public.

The Northern Cheyenne Reservation is a redesignated Class I Area not a federally mandated Class I Area and as such visibility impairment within the area is not addressed by the recently signed regional haze rule nor the existing visibility regulations for reasonably attributable impairment. Although the Division understands the desire to calculate visibility impairment at the Northern Cheyenne Reservation, the Division also believes that it is important to disclose the difference between this Class I Area and the two other federally mandated Class I Areas considered in the visibility impact analysis.

BUREAU OF LAND MANAGEMENT
30 [illegible]
BUFFALO RESOURCE AREA

Richard Zander, BLM
Wyodak CBM DEIS
Page 2

The documents disclose that the Limits of Acceptable Change (LACs) have been established by a US Forest Service policy for evaluating impacts to Air Quality Related Values in Wilderness Areas but fail to mention that the LACs are not regulatory limits or standards. Failure to disclose that LACs are not regulatory limits or standards may lead the average reader into believing that an air quality standard or limit is being violated based on the results of the visibility impact analysis.

Although the Division continues to maintain that there are more appropriate locomotive source characterizations that would certainly affect the magnitude of the projected cumulative visibility impacts, we also recognize that the projected visibility impacts from the Wyodak CBM Proposed Project are minor, probably using either characterization method, in comparison to the projected cumulative visibility impacts. Consequently, we will not press the issue and are satisfied that our more substantive comments have been addressed by the BLM.

If you should have questions regarding the comments, please feel free to contact this office.

Sincerely,

Dennis Hemmer

Dennis Hemmer
/ Director

cc: Dan Olson
Bernie Dailey
Darla Potter

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BUREAU OF LAND MANAGEMENT
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Comments on Draft Environmental Impact Statement

Page 1-1, Last Paragraph, 3rd Sentence
The Air Quality Division does not conduct Prevention of Significant Deterioration (PSD) analysis on all permit applications submitted to the Division. PSD analysis is only conducted for permits submitted by sources subject to the PSD regulations. Please reword this sentence to read

> "At that time additional site specific air quality analyses, such as a Best Available Control Technology analysis or Prevention of Significant Deterioration increment analysis, may be performed."

Page 1-13, 3rd Paragraph, 2nd to Last Sentence
This statement is incorrect as the Wyoming Department of Environmental Quality does not have rules regarding noise limits. This sentence is also inconsistent with information contained in the DEIS in the 3rd sentence of the 2nd to last paragraph on page 4-113. Please delete this sentence from the text.

Page 4-62, 3rd Paragraph, 3rd Sentence
The Division only has regulatory authority over point sources not mobile sources. The regulatory authority for mobile sources (i.e., rail, on-road, and off-road) lies with the Environmental Protection Agency. Please reword this sentence to read as follows

> "Prior to construction and/or operation of any pollutant point sources analyzed in this EIS, the WDEQ-AQD has the regulatory authority to review permit applications and to require permits, fees, and control equipment."

and add an additional sentence as the last sentence of the paragraph to read as follows.

> "The US Environmental Protection Agency has the regulatory authority to control emissions from the mobile pollutant sources analyzed in this EIS."

Page 4-68, Last Full Sentence at top of page
The Division believes that the sentence contains a typographic error and should read as follows.

> "...catalytic controlled rich-burn engines..."

Page 4-69, 1st Full Paragraph, 2nd to Last Sentence
To make this sentence correct it should be revised to read as follows.

> "The average annual NO_2 background ..."

Page 4-71, 4th Paragraph, 1st Sentence
Please revise this sentence to accurately disclose what the WDEQ-AQD does during the permitting process.

> "...complex, would address the risk of exposure to formaldehyde."

BUREAU OF LAND MANAGEMENT
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Page 4-74, Last Paragraph, Last Sentence
To accurately reflect the methods used to calculate aerosol extinctions this sentence needs to be revised to read

> "For ammonium nitrate and ammonium sulfate the coefficients..."

Table 4-28, 2nd Column Heading
This column heading lacks consistency with the rest of the DEIS as the word "airshed" is used instead of "area" to characterize the type of area of concern. It has been the Division's experience that the word "airshed" typically refers to an area encompassing most, if not all, sources contributing to air quality impairment at a specified receptor as opposed to the receptor itself. The Division requests that the word "airshed" be replaced with the word "area".

Comments on Air Quality Technical Reference Document

Page I, 3rd Paragraph, 2nd Sentence
The Air Quality Division does not conduct Prevention of Significant Deterioration (PSD) analysis on all permit applications submitted to the Division. PSD analysis is only conducted for permits submitted by sources subject to the PSD regulations. Please reword this sentence to read

> "At that time additional site specific air quality analyses, such as a Best Available Control Technology analysis or Prevention of Significant Deterioration increment analysis, may be performed."

Page 8, 3rd Full Paragraph, 3rd Sentence
This sentence is incorrect. To accurately reflect the background visibility data used in the calculation of visibility impairment this sentence needs to be revised to read

> "...considered the mean of the cleanest 20% background visibility data ..."

Page 2-1, Section 2.1, 2nd to Last Sentence
The Division believes that the sentence contains a typographic error and should read as follows.

> "...catalytic controlled rich-burn engines..."

Page 3-8, 1st Full Sentence
The Division believes that the sentence contains a typographic error and should read as follows.

> "...Gillette NO_2 monitoring."

Page 5-29, 1st Sentence
The sentence contains a typographic error and should read as follows.

> "...operations, truck dumps, wind..."

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BUREAU OF LAND MANAGEMENT
JUL -1 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

3432 So. Hwy 59
Savageton Rt.
Gillette, WY 82718
June 28, 1999

BLM
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Dear Mr. Zander:

We had already begun this letter in regards to our personal problems and concerns on our home well when the notice arrived telling of the extension to the comment period on the Wyodak Coal Bed Methane (CBM) Environmental Impact Statement (EIS). Please consider this letter both a comment on the latter, as well as a statement as to our predicament.

In May of 1998 we wrote to you with concerns about our water well as it is on the same aquifer as the Lighthouse Coal Bed Methane Project. (See enclosed) Knowing that it would do us no good "to stand in the way of progress" we simply requested that our water well be monitored. Response was that, as we were led to believe, our well would be monitored. (See enclosed) To date we have never seen or heard from anyone in regards to this.

At this point it may be like "shutting the gate after the cow has gotten out", but the fact of the matter is, we no longer have the water we used to have. Do you know how disconcerting it is to be in the middle of your shower and shampoo and suddenly no water? Have you planted and landscaped for twenty years, planted an annual vegetable garden, and then tried to squeeze out an hour or two worth of trickle irrigation per day to keep the most important alive? There is no overflow from the cistern to feed the little pond for stock water, ducks and geese. It is no longer possible to even fill the cistern more than one third, and that is with keeping a close watch on our household consumption.

We believe that the Lighthouse Methane Project is, without a doubt, the cause of our loss of water. As a domestic water source, our well holds priority in Wyoming statutes for preferred use. Our request is that you would act expediently in supplying us with information and procedures in rectifying this situation so that we might once again appreciate this life-giving resource, water.

As to our comment on the Wyodak CBM, how much longer will a government that was established "by the people, of the people" continue to allow, nay, encourage the rape and pillaging of our earth. When one of our most important natural resources is gone, how will the people live here. We cannot trust a government whose bureaucrats and big business worship the "almighty dollar", laying sacrifice the many individuals who are the true stewards of this beautiful land.

You who have been entrusted with decision-making powers must use that power wisely. Think not of just today but project yourself into the future. Nothing lasts forever, but please, preserve our water, and our freedom and ability to live here in this area, even to our grandchildren.

We are sincerely and anxiously awaiting your reply.

Gary and Louise Kay
Gary and Louise Kay

BUREAU OF LAND MANAGEMENT
JUL -1 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

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BUREAU OF LAND MANAGEMENT
BUFFALO [illegible]
88 MAY 16 AM 10:57

BUREAU OF LAND MANAGEMENT
JUN -1 [illegible]

7

3452 So. Hwy. 59
[illegible] Rd.
Gillette, WY 82716
May 12, 1988

Area Manager
Bureau of Land Management
Buffalo Resource Area
189 North Cedar
Buffalo, WY 82834

Dear Mr. [illegible]:

Having analyzed the environmental assessment for the American Oil and Gas Lighthouse Coal Bed Methane Project we would like to make comment.

Of the three God given resources, air, water and land, we Wyomingites must put the highest value on water as it is the shortest in supply. Wyoming water rights are historically based on the first to put water to beneficial use has the first right or, perhaps simply put, "first come, first served." In the past, water was sufficient to supply the small agricultural population. Therefore, the waters of Wyoming flowed out-of-state and our neighbors dutifully established their water rights. Now, as industry grows in our state, water use and consumption is of major importance. Since Wyoming no longer holds the "first rights" to most of its tributaries, and surface water is minimal, we must look to ground water as the source available.

Geologists and hydrologists assure us that ground water supplies are unquestionable; that much of the water is unfit for human consumption. We are to assume, therefore, it is best put to industrial uses. At one time we were told the Madison Aquifer could not be used domestically, yet, several thousand people now use this ages old water daily. As to this great supply, if ones' well has "gone dry", there is no access to the supply and life is, at best, difficult.

Wyoming water laws give us the definition of preferred uses; first in that list is drinking water for humans and livestock. However, last on the list is water for industrial purposes.

Our particular concern is with ground water, and individually, that of our domestic use well as it is in the coal aquifer. We feel that knowledge of the impact upon the aquifer by the Lighthouse Project is uncertain. Too little consideration and protection is provided for the established ground water rights. We feel the area monitored should be enlarged and more provision, namely monetary, should be available for mitigation.

1. We would like to request monitoring of our domestic well; this to include a baseline inventory and a periodic aquifer monitor. This could also be considered a test base to determine impact of the project outside the boundary and away from surface mine interruption.

We hope you will consider these, as well as other, points in deciding the fate of our life-giving sustenance, water.

Sincerely Yours,

Gary – Louise K

Gary and Louise Kay

copy:
Jill Morrison
Powder River Resource Council

BUREAU OF LAND MANAGEMENT
JUN -1 [illegible]
BUFFALO [illegible]

Response to comments received from Gary and Louise Kay

1. The operator has agreed to monitor wells outside the 2-mile buffer zone if requested. The BLM has contacted the Kays, and will contact the operator to arrange monitoring for this well.

   Please refer the response to the Powder River Basin Resource Council for additional discussion of water monitoring and mitigation.

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BUREAU OF LAND MANAGEMENT
JUL - 1 1999
BUFFALO FIELD OFFICE
BUFFALO WY

June 29, 1999

Mr. Richard F. Zander
BLM, Buffalo Field Office
1425 Fort St.
Buffalo, WY 82834

Dear Mr. Zander:

I am writing in response to the Environmental Impact Study regarding the Coal Bed Methane Project for the WYODAK Coal Bed Methane Project.

As a landowner within the described area and as a property targeted by a methane company for drilling, I have many concerns regarding the coal bed methane industry.

I have concerns regarding water well agreements, landowner compensation, water deployment, wildlife issues, etc., but I will only address my concerns not necessarily covered in the impact statement.

As a grazing permitee, I have entered into a grazing management plan with the BLM on our ranch. We have been fortunate to have the BLM aid us in a water pipeline project, as well as providing fencing materials. These projects have helped us improve range management through moving cattle and directing grazing by turning water tanks on and off in predetermined patterns.

If the water produced by methane drilling practices is allowed to flow down draws and/or placed in numerous reservoirs, it obviously reduces our ability to use water that we can control to direct grazing, and thus possibly negatively affecting our grazing plan to the detriment of the resource.

More emphasis should be placed on working with the grazing permitees and landowners to not have their ranch negatively impacted by the helter-skelter deployment of water. Some may feel every rancher wants and needs more water, but many have plenty already and more water would certainly be a detriment to their operations.

The BLM should also be concerned and willing to recognize the possible negative impact methane development will have on the aesthetics of the land as well as the current way of life in the proposed areas. We should not be so concerned and motivated by the almighty dollar that developers are allowed to just trample over the beauty and tranquility of the open range land. Many landowners and ranchers live in these remote areas because of the solitude and remoteness, and are not anxious to change their way of life.

Every effort should be extended to work with the affected landowners, as well as their neighbors. I would hope that the BLM does not just open the flood gates and allow the methane developers to run wild. We have seen too many examples of hurried development and later say we should of thought before we cashed the check.

Thank you for your time and consideration.

Respectfully submitted,

Peter J. Dube
8885 US 16 West
Buffalo, WY 82834
307-684-2528

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CITY OF GILLETTE
P.O. Box [illegible] • Gillette, Wyoming [illegible]
Phone (307) [illegible]

BUREAU OF LAND MANAGEMENT
[illegible] -2 [illegible]
BUFFALO FIELD OFFICE
BUFFALO, WY

DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

June 30, 1999

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

RE: Wyodak Coal Bed Methane Project
Comments on Draft Environmental Impact Statement

Dear Mr. Zander:

I have reviewed the draft EIS and have prepared the following technical comments regarding the anticipated impacts. In addition, Mr. Larry Wester of Wester-Wetstein and Associates, Inc. of Laramie has reviewed the draft document at my request. I have incorporated his technical comments into this letter. Mr. Wester's comments are easily identified as they are mostly directly related to groundwater, geology and modeling.

1. Page 1-13, paragraph 2 states "No permits would be required for the proposed project from the affected counties, the City of Gillette, or the City of Wright." It is not clear if this statement applies only to air quality and noise or is a general statement. Construction within the City of Gillette could require that a permit be obtained. The City, by ordinance, issues construction permits for drilling within the jurisdiction. Use of existing rights of way or easements dedicated or owned by the City would require permits. Discharge of water within the City limits into the City's storm drainage system, including surface drainage, requires a permit. The City does have noise ordinances that could affect drilling or construction within the jurisdiction.

2. On Table 2-1, the maximum annual volume under the proposed action (3,000 more wells) is calculated to be 58,072 ac-ft/yr. Under the Alternative 1 (5,000) additional wells, the maximum annual volume is calculated to be 96,787 ac-ft/yr. The table indicates that this is the maximum volume, but these numbers seem to be based on an average production of 12 gpm per well. For purposes of this study, they have assumed an average production of 12 gpm on page 2 -13. It would appear that the volumes represented would be average discharges rather than maximum discharges. It should also be noted that these discharges are in addition to the current discharges associated with existing CBM (coal bed methane) wells and the natural discharge from the streams. To put these discharges in a municipal use context they are 36,000 gpm (51,840 mgd) and 60,000 gpm (86,400 mgd) for the Proposed action and Alternative 1 action respectively. To put these discharges in a stream flow context, they are 80 cfs and 134 cfs, respectively. For comparison, recordings on Stonepile Creek just upstream of Interstate 90 for Water Year 91 show no recordable flow for 5 months of the year and a mean monthly flow that varied from 0.091 cfs to 1.10 cfs for the remaining seven months. Even with conveyance losses, the increase in flow at specific locations may be dramatic.

3. Table 2-2. The disturbed areas under all alternatives do not address erosion disturbance of intermittent streams that would be carrying the total estimated water production.

4. Page 2-13. The 12 gpm assumed for the average production per well is based on 300 CBM production wells located in the project area in 1998. They had some records that showed less production - 10.4 gpm, and reports to the Wyoming Oil and Gas Conservation Commission which showed an average of 14.8 gpm. I am not sure if these averages would be the same with the inclusion of the production of wells located along the Highway 59 corridor. This is a key issue relative to potential impacts. The average might be significantly greater than 12 gpm when factoring in new data which could consequently result in higher impacts. The preparers of the draft EIS are in somewhat of a disadvantage because the dynamics of the development are changing rapidly.

5. On page 2-14, it is noted that the operators will be asked to develop water management plans where multi-well projects are planned. To be cost effective, it appears that almost all of the development will be through multi-well projects and it seems that water management plans should not be optional. I keep thinking about the potential impacts to Donkey Creek and Stone Pile Creek. What will be the flows in these drainages and is the flooding protection currently in place adequate with a sizeable increase in the base flow. Also, will these discharges aggravate the groundwater problems currently encountered in Gillette? A pod of 6 wells producing at 12 gpm will increase the base flow of its receiving drainage by 0.16 cfs. This increase for a single pod is greater than the mean flow recorded for 6 months on Stonepile Creek in Water Year 91. Water management plans should be required that

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fully address these issues. The City of Gillette needs to be fully involved in the water management plans for the CBM wells that are upstream of the community.

6. Page 2-22. The CBM operators should bear the cost of any improvements to the major floodways through communities when such improvements (or repairs) are directly related to the CBM operation.

7. On page 2-24, the total project life, including production, is expected to be 12 to 17 years. It would be good to know what this is based on and how this life span was derived.

8. On page 2-28, the prospect of injecting produced underground water is discussed. It is concluded that the water cannot be injected into the lower Ft. Union Formation. This is not what we were told during our meeting with representatives from the DEQ in Cheyenne. They further conclude that the water can be put to a number of subsequent beneficial uses once it is pumped to the surface. From our discussions with the State of Wyoming Officials, I do not think the concept of re-injecting the water was adequately addressed or the potential benefits recognized. We have conducted a re-injection test by removing a pump from a well completed in the Ft. Union formation and letting system water reverse flow into the well. Over a sustained period, the in-flow rate was about 120 gpm. This did not involve pumping. Based on this test and using the value of 72 gpm per pod of six wells, it is reasonable to assume that a re-injection well would handle most of the water produced from two pods of six wells.

9. On page 3-6, the draft EIS indicates that methane can migrate long distances along naturally occurring joints or fractures in rocks. I think this is a significant concern for those developers in and adjacent to the City of Gillette and neighboring subdivisions. There are no recommendations for the developers to address this issue. This is a serious issue as coal bed methane was the proximate cause leading to the closure of an entire subdivision north of Gillette.

10. Page 3-8 indicates flows in the Belle Fourche range from 0 to 10,300 cfs. The mean and median flows should be emphasized as they are more closely related to baseflows. This would be more in line with the way the CBM production is described (averages, means, etc.).

11. Table 3-3 shows a current outflow of 17,400 ac-ft/yr on the Belle Fourche River. From the figures provided on page 3-13, the outflow will be increased

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by 8,904 ac-ft/yr. This is more than a 50 percent increase of Powder River Basin water that will be going to South Dakota, much of it flowing through Gillette.

12. Page 3-13 indicates that sediment loads will be increased. Page 3-16 identifies Gillette Fishing Lake as not supporting all of its designated uses due to silt and phosphate. The EIS should evaluate the impact of increased sediment load on the Gillette Fishing Lake and possible impacts to the dam itself from more frequent overtopping. A paved road is located on the top of the dam and also serves as part of the emergency spillway. What impacts can be anticipated?

13. On Page 3-23 the Tongue River Member is lumped together with the Lebo Shale member of the Fort Union Formation as an aquitard. This seems incorrect based on the information we have obtained from well logs. The Tongue River Section is the major aquifer in the Fort Union Formation in the Gillette area. This is where the best quality of water and cleanest sands are located and is really the main water producing zone. In this section of the EIS, they consider it a confining layer which separates the Wyodak coal seam from the Tullock member of the Fort Union. While the Lebo Shale member may effectively do this in places, the Tongue River member is the main aquifer everyone is shooting for and directly underlies the Wyodak coal seam.

14. Page 3-24 indicates that the Tullock yields are 200 to 300 gpm making it the attractive zone for municipal and industrial development. Later on the same page is stated that all water for domestic consumption is derived from groundwater supplies predominately from the Tullock aquifer. This is simply not true. With the possible exception of City of Gillette Well 8-22, we have tried to use as much of the Tongue River member as possible. We installed bridge plugs in COG Wells 8-11 and 8-12 because of water quality. The bridge plugs were installed to seal off the underlying Tullock member and produce water from the overlying Tongue River member. If you will look at the COG wells you will note that as we go from east to west, the water quality generally improves. This is because we are able to use more of the Tongue River member for water development in the westerly wells.

15. Table 3-9 shows problems with iron and manganese, if some of the water was to be used for municipal drinking water. Use of the water for municipal use is not thoroughly discussed in the report. We have been in contact with several CBM operators regarding reuse by the City. The most advanced

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discussions are with Permeon. It is my belief that with proper well design and construction, the water could be used for municipal uses. Such uses could include re-injection for aquifer restoration, irrigation of large parks and golf courses, development of water related recreational areas, and, with appropriate treatment, use as a complete municipal source.

16. Page 3-26 indicates that water for domestic and livestock uses can generally be found less than 1,000 feet below the surface. This is true, but throughout most of the Gillette area at 1,000 feet or less the water is coming from the Tongue River member of the Fort Union Fm. (This is in conflict with statement presented in Paragraph 14 above.)

17. On page 3-26, they make the statement municipal water supply wells in the project area are predominately associated with the City of Gillette use of the Tullock aquifer. Again, while we do produce water from the Tullock, we try to get as much water as possible from the overlying Tongue River member because the yields are higher and there is a lower concentration of fluorides. This statement is generally wrong. Existing recent reports that were complete for the Wyoming Water Development Commission on Crook Road, Pine Butte, Antelope Road, Sleepy Hollow, Wright, and the City of Gillette wells are all available from the WWDC, the State Engineer's Office and in most cases the University of Wyoming. These reports clearly indicate the producing members of the overall Fort Union aquifer.

18. Page 3-26 indicates municipal use in Gillette exceeds two million gallons annually. This is correct in that use does exceed two million gallons per year but totally inaccurate. Non-peak use is about two million gallons per day with peak use of about 11.5 million gallons. These values include water sold to customers outside of the city jurisdiction. The values do not include water consumption in several subdivision or I &S districts located in or adjacent to the jurisdiction of the City of Gillette.

19. On page 4-2, the EIS acknowledges that methane could migrate over considerable distances and emerge in water wells near coal bed methane activity affecting water wells and residences. Again, the developers in and around the City and surrounding subdivisions should proceed with caution.

20. Page 4-2 discusses likely impacts to mine sediment structures designed to accommodate historical flows. The City of Gillette major storm drainage system is design to accommodate historical flows. Overtopping of these structures and channels due to an increased base flow could have immediate

and devastating effects on the community. This needs to be fully addressed. Also the local city and county emergency management officials need to be notified of the potential for impact.

21. On page 4-4, it is indicated that the productive life of a CBM well is estimated to be 12 to 18 years. I am not sure if this in conflict with 12 to 17 year life span indicated on page 2-24. The 12 to 17 year life span may reflect more of the coal bed methane production life rather than individual wells. If so, this would indicate that the wells will "dry up" before the life span is over. This should be clarified.

22. On page 4-5, the EIS indicates the flows are expected to increase from 15.1 million gallons per day to 66.1 million gallons per day. 66.1 million gallons per day calculates to 74,047 ac-ft/yr which doesn't correspond with the figures shown on Table 2-1 (refer to Paragraph 1). Which is right?

23. Page 4-5 indicates infiltration will be about 20% of the conveyance losses that are estimated to be 23 to 58 percent of projected discharges. There is already a significant shallow groundwater problem in Gillette. What effect will the calculated conveyance losses in-stream and upstream of Gillette have on shallow groundwater levels? Is there a possibility of accelerated foundation and basement damage? Who mitigates the problem if it occurs?

24. On page 4-6, it is indicated that the outflow of the Belle Fourche River will double which is significantly more than what is represented on Table 3-3 and page 3-13. On page 3-13, a flow 12.3-cfs or 8,904 ac-ft/yr is anticipated to be added to the Belle Fourche River. On table 4.1, the expected CBM Well discharge at the Bell Fourche River is anticipated to be 19,243 gpm allowing for conveyance losses. 19,243 gpm equates to about 43 cfs or over 31,000 ac-ft per year. There is a conflict here.

25. Page 4-6 has a reasonable good discussion of the potential impacts to the land by the produced CBM water. These include erosion, flooding, etc. See previous comments.

26. On page 4-12, it is concluded that CBM generated flows, alone, are unlikely to cause significant flooding within the project area. I am not so sure this is true particularly where the drainages are so poorly defined and at least the initial yields may average substantially more than 12 gpm. If overbanking occurs within a developed area such as Gillette, there may be more significant impacts than the formation of overbank deposits.

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27. On page 4-38, they indicate that 6 layers were used in the model. The upper [illegible] layers are associated with Wasatch Fm. and the Wyodak coal seam, and the lower two layers were used to represent the Lebo shale and Tongue River "aquitard" separating the Lebo from the Wyodak coal bed. This indicates that they did not include the Tongue River member as an aquifer in the model. As indicated elsewhere in my comments, the Tongue River member is the most important Ft. Union Fm. member to the City and other users of the Ft. Union Fm. If my understanding of the construction of the model is correct, I believe this to be a very serious flaw in the model and the EIS in general since none of the results reflect the impacts to the Tongue River member.

28. On page 4-38, it is indicated that water level changes above or below the coal are not expected to be significant because the coal is partially confined both above and below by a low permeability claystone layer. In the Gillette area we often have a very thick, medium to coarse-grained sand under the coal. They also indicate that the Lebo member is 800 to 1,000 feet thick. The Lebo and Tongue River members together are 800 to 1,000 feet thick. We have never found the Lebo member to be 800 to 1,000 feet thick when evaluating the numerous geophysical logs looked at during the course of the Ft. Union Aquifer Study. Most of the time, we found the Lebo Shale ranged in thickness from 200 to 300 feet and in some areas the Lebo Shale is very difficult to identify because it is very similar in composition to the overlying and underlying Ft. Union members. This thickness corresponds very well to the stated thickness for the Lebo shale member contained in USGS Professional Paper No. 404, Stratigraphy and Structure of the Northern and Western Flanks of the Black Hills Uplift, Wyoming, Montana, and South Dakota. This paper further describes the Tongue River member, at the top of the formation, as consisting of sandstone, some shale and several thick coal beds. It also indicates that the difference between the Tongue River and Lebo becomes less pronounced in the southern part of Campbell County. From the work done in the Gillette area, we have noted are three very pronounced members, the Tongue River, the Lebo shale and the Tullock in descending order.

29. The preparers of the EIS indicate that they consider the 12 gpm to be very conservative. Is this the case considering the recent drilling?

30. On page 4-52, the EIS predicts 575 feet of drawdown in the general area we have sited as a municipal well field. It would appear that either the estimated drawdown is high considering the amount of sands in the Tongue River Formation or the anticipated withdrawals are low. If the 575 feet of drawdown is real, and extends into the sands below the Wyodak, this could be a severe depletion of a valuable resource. Basically, because of the way they treated the Tongue River member of Ft. Union Fm., the model may be flawed and not accurately predicting the impacts of the development.

31. On page 4-61, the EIS predicts 675 feet of drawdown in the proposed municipal well field. The same concerns apply.

32. The EIS discusses monitor wells. The focus of these monitor wells appears to be on the Wyodak coal seam and the overlying Wasatch Fm. There is very little discussion, if any, relative to constructing multiple completion water wells with completions in the good sandstone sections below the Wyodak coal seams. Inadequate attention has been given to zones underlying the Wyodak coal seam.

33. It appears from the description of their groundwater models, that the authors of the EIS do not have a thorough understanding of the geology associated with the Fort Union Formation. This presents a real problem with the forecasted impacts on the groundwater resources in the area and may result in underestimating of the impacts on both groundwater and surface water.

As you can readily determine, I am primarily interested in the impacts to the City of Gillette's municipal water source, possibly augmenting our water resources, impacts to our drainage system and impacts due to an increase in shallow groundwater resulting from seepage. I do not think the potential impacts are insurmountable but I do feel strongly that they be addressed in the EIS.

Thank you for providing an opportunity to make comments on the draft EIS.

Respectfully,

Bill A. Carson

Bill A. Carson, PE
Public Works Director/City Engineer

BAC/kb
Cc: John C. Darlington, City Administrator
Jon C. Young, Director of Utilities
Tom Langston, Director of Community Development
Larry Wheeler, Wester-Wetstein and Associates, Inc.
Dick Stockdale, State Engineer
Mike MaCoy, Campbell County Engineer
BAC:99-034

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United States Department of the Interior
BUREAU OF RECLAMATION
Dakotas Area Office
Rapid City Field Office
[illegible]
Rapid City, South Dakota [illegible]

IN REPLY
REFER TO:

DK-700 (Anderson)

JUL 1 1999

BUREAU OF LAND MANAGEMENT
JUL -2 1999
[illegible]

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Subject: Review and Comments of Draft Environmental Impact Statement for the Wyodak Coalbed Methane Project

Dear Mr. Zander:

The Dakotas Area Rapid City Field Office, Bureau of Reclamation, is the owner and operator of Keyhole Dam and Reservoir near Moorcroft, Wyoming. We appreciate the opportunity to comment on the Draft Environmental Impact Statement (DEIS) and would like to be informed of developments concerning the project due to the impacts in operation of Keyhole Dam and water quality concerns for the irrigators on the Belle Fourche River in both Wyoming and South Dakota. The following are our comments on the DEIS and the project in general.

1. Water Quantity: If the projected outflows shown in Table 4-1 of the DEIS are correct, this will have a definite impact on the operation of Keyhole Dam. The outflows shown for the no action, proposed action, and alternative 1 scenarios all exceed the mean annual inflow of 21,000 acre-feet for Reclamation's 46-year period of record at Keyhole Reservoir. The outflows projected could cause Reclamation to release more water downstream to the Belle Fourche River. The public, Crook County Irrigation District, Belle Fourche Irrigation District, Keyhole recreationists and others need to be informed of the potential impacts of coalbed methane development.

2. Water Quality: Information from the DEIS would indicate good water quality from the project. The Crook County Irrigation District, Belle Fourche Irrigation District, and the public need to be informed of any potential impacts to the Belle Fourche River.

Thank you for the opportunity to comment. If you have questions please contact Curt Anderson or myself at (605) 394-9757.

Sincerely,

Jeffrey L. Nettleton

Jeffrey L. Nettleton
Rapid City Field Office Manager

cc's: Mr. Don Lowry
State Engineers Office
Herschler Building 4E
Cheyenne, WY 82002

Mr. Ron Siefert, Park Superintendent
Keyhole State Park
353 McKean Road
Moorcroft, WY 82721

Mr. Michael B. Whitaker
State Engineers Office
P.O. Box 6103
Sheridan, WY 82801

Mr. George S. Waters, Chairman
Crook County Irrigation District
447 McKean Road
Moorcroft, WY 82721

Randy Oliver, Manager
Belle Fourche Irrigation District
P.O. Box 225
Newell, SD 57760

BUREAU OF LAND MANAGEMENT
JUL -2 1999
[illegible]

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"Eric Korfanta" <[illegible]> on [illegible] AM

To: Richard Zander/[illegible]/BLM
cc:
Subject: coal bed methane project

Dear Mr. Zander:

I know I'm just 2 days late with sending my comments, but I hope they will be considered.

I am really concerned that we may rush through the process of permitting coal bed methane projects. I just returned from a trip back east, and am even more convinced that Wyoming has to do what it can to preserve our land for future generations--there isn't enough for the growing populace now. It's our responsibility to do all we can to ensure a quality environment.

Groundwater is a major concern....just how are we going to treat it? We need to put it to the best use possible before it's piped who knows where.

Reclamation is another major concern....are you going to require that the land be reclaimed at the highest level--to natural habitat--or just to minimum standards? Our wildlife is our state's greatest resource (except for the habitat the wildlife depends upon). It's the resource that all the people in more populated states crave to see when they visit.

We also need to be concerned about the landowners wells and land...are plans in place for this?

Thanks for your time and energy on this matter.

Sincerely,

Eric Korfanta

address: P.O. Box 453 Ranchester, WY 828399

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Gillette
Area
Groundwater
Monitoring
Organization

c/o Peabody Group
Caller Box 3034
Gillette, WY 82717

BUREAU OF LAND MANAGEMENT
JUL -7 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

July 6, 1999

Attn: Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

RE: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement.

Dear Mr. Zander,

The Gillette Area Groundwater Monitoring Organization (GAGMO) is composed of coal mines which share their ground water level and chemistry information on an annual basis. GAGMO has presented nearly twenty years of data to regulatory agencies and the public. We wish to express our concerns with the hydrology portions of the Draft Environmental Impact Statement for the Wyodak Coal Bed Methane Project (DEIS). GAGMO believes that a new calibrated and verified groundwater model is needed. The current model is so poorly calibrated that all of the predictions made from it are in question. This model must include the most probable number of wells rather than the comparatively small number of wells predicted in the DEIS, and the well discharge rate must be better predicted. The EIS must also objectively consider all potential impacts due to coal bed methane development.

GROUNDWATER

- **GROUNDWATER MODEL.**

The groundwater model used in the DEIS is based on the Little Thunder stochastic model for the Black Thunder, Jacobs Ranch, and North Rochelle Mines as well as the Lighthouse and Marquiss EIS models. The results of the former showed such poor calibration that the model was rejected by the WDEQ/LQD, one of the organizations responsible for it, and a variation has unfortunately resurfaced here. The premise with these models was that the model parameters are statistically estimated since very little actual data are available for the aquifer. For the CBM EIS model, unique average parameters for each geologic unit were chosen. However, as with the Little Thunder, Lighthouse, and Marquiss models, much available data were not utilized for the DEIS groundwater model. Only 44 wells in the coal were used for the model calibration despite the model extent of almost 20,000 sq. mi. Once again, GAGMO must comment that the BLM has attempted a groundwater model for an extremely large area with very little data.

The model is poorly calibrated. As Table 1 shows, differences between actual and predicted heads are well over 100 feet over much of the model area, even around the mines. In the southern part of the basin, near the North Antelope/Rochelle Complex and Black Thunder Mine, the differences between actual and predicted heads range from 176 to 207 feet. Depending on the model parameters, this should lead to similar or greater underestimation of drawdown in the central part of the basin. This is described as a "reasonable" match with observed water levels. Drawdown comparisons are made between GAGMO maps and model drawdowns for 1995. The maps are at different scales and there is no legend on any of the maps in the model technical review. The scales are such that the sections on one map look like the townships on the other. However, digitized map comparisons (Figure 1 of this package) show that there is not good agreement with up to 8 miles of difference between the actual and modeled 5 foot drawdown lines. This is described as "comparing favorably" and as "lending credibility to the model" on the top of page 6-1 in the model technical report. The graphs on Figures 5-9 and 5-10 show apparent underestimation in modeled drawdowns.

Numerous recent groundwater models and pump test data are available in mine permits. Most of these models were performed with various MODFLOW variations as was the DEIS model. The information available from these models was apparently not used in the creation of the EIS groundwater model. The model information is partly based on the Little Thunder Pilot CHIA which showed similar technical problems (calibration, failure to incorporate structures, etc) and the 1988 USGS CHIA which was constructed when there was a much more limited data set.

The North Antelope/Rochelle ground water model completed in 1996 had promising calibration residuals of between 0 and 10 feet in the coal and between 1 and 31 feet in the overburden. In 1990, verification error were between 0 and 6 feet in the coal and 2 and 16 feet in the overburden. The mean absolute error for the coal and overburden were 3 and 13 feet respectively. In 1995, verification errors were between 1 and 12 feet in the coal and 0 and 15 feet in the overburden. The mean absolute error for the coal and overburden were 6 and 8 feet respectively.

The Caballo Mine recently completed a groundwater model for the forthcoming amendment to incorporate the North Caballo property into the mine. This model, which covers the area between the Wyodak and Coal Creek Mines, is a modified version of models completed for the Belle Ayr Mine and the Rocky Butte permit application. The initial head calibration residual for the coal in this model is from 0 to 9.6 feet. Due to the highly discontinuous nature of the overburden in this area with isolated relatively permeable sands within relatively impermeable clays, no calibration was made for the overburden in this model.

The Little Thunder area, the same general area covered by the Little Thunder pilot CHIA, has been modeled recently for the North Rochelle and Black Thunder Mines. Steady-state calibration was between 0 and 9.5 feet. 1995 verification was to within 6.7 feet of actual drawdown. As with the Caballo model, no overburden calibration was conducted for the North Rochelle and Black Thunder models. The groundwater model for the Buckskin Mine, north of Gillette, had a set calibration standard of 10 feet.

The description of the model does not agree with the model itself, aside from the generous descriptions of accuracy previously discussed. The model has eight layers although only two are actually considered effective. The coal is modeled as a single homogeneous unit. However, it is claimed on page 4-20, that faults and lineaments are incorporated into the model. The failure to account for structures may explain much of the error in the model. Lineaments that coincide with streams are visible on the drawdown maps available from GAGMO and discussed in groundwater models from the mines. The modeled CBM well pumping rate of 12 gpm may currently be

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accurate near to the current CBM field near to Cordero. However, some wells will pump over 100 gpm, as seen in recent CBM wells drilled west of Hwy 59, and some will initially produce less than 5 gpm. However, fracing is now commonly used to increase the yield of CBM wells. Fracing in mine dewatering wells and CBM wells has often more than tripled water production.

The increased level of fracturing in the southern portion of the basin (see below) and away from the outcrop where the coal is thicker would explain the discrepancy between the 12 gpm modeled pumping rate and the greater pumping rate reported by mines and CBM operators. Given the hydraulic parameters for the coal aquifer presented on Table 4-1 and one-quarter mile well spacing, it is doubtful that 12 gpm would be a high enough discharge rate to cause the significant dewatering needed for CBM production. The members of GACMO are concerned about the low modeled pumping rate, not only because the impact on aquifers will be underestimated, but also since the impact of high surface discharges needs to be properly predicted.

It is not accurate to model the coal uniformly across the Powder River Basin (PRB). While the estimates for the average coal conductivity and storativity are not necessarily inaccurate, by not accounting for the structures in the coal, the authors miss the main controls of drawdown and subsurface flow. When dewatered, these zones essentially act as huge drains to dewater adjacent tighter areas. Table 2 shows a comparison of aquifer parameters from the DEIS Model and recent mine groundwater models. The Porcupine Creek area within and upgradient from the North Antelope/Rochelle Complex is an example of such a fracture zone in the southern portion of the DEIS model area. Similar structures are known from other mining areas including the Little Thunder Creek area. Pump tests from the mines in the southern part of the basin indicate that the coal is indeed more fractured in this area (see page 4-13 last paragraph of the Technical Report). Numerous pump tests have been completed for the mines in this area since 1980. Only six wells from the area south of Wright were used for calibration of the DEIS model. The calibration differences in this area was between 176 and 207 feet. Why didn't the authors try to adjust this model with recent pumping test data from this area?

By having the initial heads too high, the model far exceeded actual drawdown near the mines (see Figure 1). It is also possible that the heads are too high due to the coal being modeled too tightly (i.e. too low a conductivity) as shown by the exaggerated early recovery of the recovery curves (Figures 5-9 and 5-10). This should have been adjusted for during model completion, or at least discussed. If it is indeed true that the coal was assigned an unrepresentatively low conductivity, then the model will underestimate the pumping rate, amount of discharge, extent of drawdown, and possibly the final amount of drawdown depending on the time of dewatering, especially in the southern portion of the model area. One glaring error in the model is that the drawdown shown near the outcrop at the mines is much more than the preexisting saturated thickness. This error is more than 100 feet in many instances. This is related to the elevated initial heads. The global water balance of the model may be off by only two percent, but the geology of the model is not accurately depicted and the model not calibrated, therefore, this result is meaningless. Of course, it is possible that there are modeling errors that cannot be gleaned from reading the technical report.

The overburden is modeled homogeneously as a fine-grained sand which rarely occurs in the PRB as channel and aeolian deposits. Sand bodies are quite common, however, in the current CBM area between the Caballo and Cordero Mines. These sands are often not hydraulically connected. For instance, a monitoring well completed in a permeable sand layer less than one quarter mile from the Caballo pit has seen less than 0.5 feet of drawdown in one year. At some other mines, however, the highwalls are almost entirely clay with very little intervening sands or coals. It is also not realistic to model the layer between the overburden and coal as impermeable clay in all cases, although the DEIS model vertical conductance is greater than that of the recent mine groundwater models. Since very little overburden dewatering will occur due to coal dewatering according to the model, most overburden dewatering will occur due to mining. The model undoubtedly over-predicts the impact of mining on overburden water levels and under-predicts that due to CBM. The North Antelope / Rochelle model predicts that the extent of drawdown in the overburden will be less than a few miles compared to the 25 miles shown by the CBM model. If the overburden portion of the groundwater model is intended to be an accurate representation of the hydrogeology of the area, why is there no comparison made to actual head data?

The plots on Figures 5-9 and 5-10 show 50 percent recovery at the BLM monitoring wells within 10 to 25 years. Similar plots from the mine groundwater models show that 50 percent recovery will take much longer. Since under the DEIS modeling scenario, neither the overburden nor the Fort Union Formation below the coal can recharge the coal aquifer, the water level at the mines must recover prior to recovery of the coal in the CBM area. Why is the recovery period for the CBM well area so short? No estimate is made of full recovery time in the CBM model. Following the curve, complete recovery may take 1,000 or more years even if wells are turned off in 2015 and the model accurately predicts drawdown. Why is there no estimate for long term recovery of the coal aquifer?

The groundwater discussion on page 4-134 and 4-135 of the DEIS which compares CBM and mining impacts under the heading of cumulative groundwater impacts has no business being in this document, most of all for its technical inaccuracy. Yet, it is not the mandate of the BLM to actively support an industry during the EIS process, let alone compare one industry to another. As stated above, the Little Thunder CHIA plan was not published because it was rejected by one of the sponsoring agencies.

Once in print, groundwater models tend to be taken by the public as statements of fact rather than predictions. In this case, a new groundwater model for the EIS is needed. The calibration errors shown on Table 1 are too great and show fundamental setup problems with the model. Drawdowns in excess of saturated thickness and the elevated initial heads are merely [illegible] errors. Calibration should meet, or at least approach, those from the mines' groundwater models in the same general vicinity. The grid spacing of the current DEIS model is not too wide to achieve this goal. Unless the model is revised, however, the model results must be questioned.

The modeled geology must match that of the project area and known structures need to be incorporated into the model. The pumping rate for the well pods must be adjusted for local hydrologic conditions. Estimates of long term recovery to pre-pumping conditions at different locations on the model must be made. After completion of the new model, a technical review and comment period must be allowed for.

- A recharge area is apparently shown on a perched alluvial aquifer which sits on a breached playa along Tisdale Creek at the Caballo Mine.
- The member mines of GACMO can help the modelers with obtaining data for a new EIS groundwater model. In addition, there are consultants available with extensive groundwater modeling experience in the PRB. The references indicate that only the Belle Ayr and Caballo Mine permits were reviewed and that these permits were not the most up to date versions. It is known that the mine permits at the Denver Office of Surface Mining are not being kept up to date with the large number of permit revisions occurring. It is, therefore, possible that the mine plans in the model are not current. However, groundwater models have been shown to be insensitive to non-significant mine plan changes. The modelers need to review mine permits on

file at the Cheyenne and Sheridan offices of the WDEQ/LQD. In addition, WDEQ/LQD staff members have a large amount of experience reviewing mine groundwater models.

- The DEIS states that the coal seam will only be dewatered to the top of coal at the well head. The dip of the coal seam should better be taken into account. Over the approximately 36 mile width of the Alternative 1 area, the coal seam will dip almost 1,700 feet as shown on the cross sections in the model technical report. At Caballo, the coal drops about 70 feet per mile on the west side of the mine (approximately 0.8 degrees), or about the thickness of the Wyodak seam. A well one or more miles west of a certain point on the coal could potentially remove all water from the coal seam at that point depending on the hydraulic properties of the aquifer. When wells are added on one-quarter mile centers across the basin, the coal near the east side of the basin may become almost completely dewatered and significant dewatering will take place towards the west. This has happened at the Belle Ayr and Caballo Mines due to nearby CBM wells (See Figure 4-2). This will greatly expand the recovery times presented in the mines' groundwater models.

- Comparisons are made to the San Juan Basin. Depressurization of coal seams by mining and recently by CBM in the PRB has caused gas migration towards mine faces and probably outcrops as recent evidence has shown. Monitoring wells near mines and CBM wells produce more gas as dewatering occurs. The 1993 Selvig and Cole reference is rather old and would only apply speculatively to PRB coals. Dewatering below the top of coal in shallower coal portions (i.e. < 300 feet overburden thickness) does not compress the coal seam as experience at mines has shown. Dry coal at some mines and around current CBM production areas still produces lots of gas. This is probably also true in deeper portions of the Wyodak coal seam. As CBM operators test how much dewatering can take place and the relative gas production, there may be a significant increase in dewatering. One current CBM operator was researching drawing the water table in deep coal seams in the PRB to the bottom of coal in order to release highly pressured gas. What increase in environmental impact will be observed if the CBM operators dewater to the bottom of the coal seam?

- The extent of the project life is not well explained. While wells may be taken out of use (e.g. from 40 acre spacing to 160 acre spacing), it remains unknown as to what the cutoff points will be for wells or what gas prices will be in 20 years. Therefore, the statement that pumping from CBM wells will stop after 2015 may be incorrect. As reported in the model technical report, water production from the producing CBM fields has remained steady after more than ten years of pumping. As well, according to local coal bed methane producers, gas production from long producing wells has maintained a steady rate or increased in many areas over that same time. If the current CBM wells have pumped for more than ten years with little decrease in pumping rate or gas production, why is the project life set at only 15 years?

- CBM wells are already being drilled west of Highway 50. Therefore, Alternative 1 may be much more realistic than the other alternatives. The maximum number of wells covered under the EIS Alternative 1 is 5000. However, CBM industry projections are that 15,000 CBM wells, as reported in the Gillette News-Record on June 7, 1999, may be drilled in Campbell County in the next 15 years. Why didn't the DEIS consider the full cumulative impact of CBM production on the Wyodak coal seam?

- Page 4-22 of the DEIS states that CBM development is primarily from the Upper Wyodak seam in the north part of the PRB, near the Rawhide and Buckskin Mines. However, it is known that CBM development is already occurring in multiple seams in the north part of the basin, including both Wyodak seams and other seams and probably in other areas as well. The BLM needs to determine the amount of multiple seam CBM well production and the resulting environmental consequences, especially in terms of water production and aquifer dewatering.

- The increased migration of gas towards residences due to dewatering of the coal seam, as may have happened at Rawhide Village, is scarcely mentioned. CBM wells have been drilled adjacent to the Sleepy Hollow and Antelope Valley subdivisions in Gillette. Specific discussions should take place concerning the possibility for migration of gas towards homes in these areas. The ground water model seems to show connection between the Wyodak coal and the clinker near Antelope Valley. Has the BLM considered the effect of CBM related dewatering under inhabited areas of Campbell County and what are the potential impacts?

- Alluvium along the east side of the basin near to the outcrop rests directly on the coal in many places. The coal mines have been required to monitor alluvial water levels and quality and in some cases to maintain alluvial water levels at minimum levels while mining. What monitoring of alluvial water levels will the CBM operators need to perform? While the effect of alluvial drainage may be mitigated somewhat by CBM discharge down streams, what will the effect on alluvial water levels be when CBM wells have dewatered the coal seam near the outcrop and pumping of CBM wells has stopped?

- The DEIS does not explain how the typical CBM production well is constructed using open hole casing. This type of well may not be able to have the pump below the top of coal and is subject to filling with coal particles. Ranchers may not be able to use this type of well reliably for water supply when the water table declines below the top of coal and following years of pumping. This needs to be discussed in the EIS. How will ranchers use water from the coal if the water table has been drawn down so far?

- State O&G commission staff have stated that operators of CBM wells have been withholding static water level and pumping rate information for reasons of confidentiality. This should be checked and if true, be stated in the EIS since it limits the accurate determination of cumulative environmental effects.

- Statements are made about potential CBM water uses whether these uses are practical or not. Are there agreements in place for the air-cooled Two Elk power plant to use coal bed methane water as stated on page 2-14 or is this only a possibility?

SURFACE WATER

- Increased surface water flows may alter, but not necessarily improve the water quality. The high alluvial ground water salinity (actually over 30,000 mg/l TDS in many cases) and salinity of adjacent rock units may leach salts. While much is made of the capacity of major streams to handle CBM water, the CBM users are actually using minor ephemeral streams in many cases to discharge waters increasing the potential for leaching of salts and erosion. Due to its low initial sediment content, CBM discharge water has much erosive potential. What requirements will be in place to correct salinity and erosion problems occurring on streams due to CBM discharge waters?

- Very little is made of the potential for icing of streams and reservoirs due to CBM discharge. Ranchers are in some cases having to remove dams to prevent icing of meadows. Unlike

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natural discharges and most mine discharges. CBM discharges will continue through the coldest part of the winter. Ranchers will not be able to use CBM water unless they can keep it warm. The EIS needs to further clarify and discuss the potential for stream icing problems due to CBM related discharges.

- Most of the coal mines have upstream large flood control structures. These structures are designed to capture the occasional storm or snow melt event. Therefore, the mines will face considerable difficulty pumping water on a daily basis to keep these reservoirs available for flood events. This needs to be included in the impacts due to the pumping of CBM produced waters. It should also be mentioned that stream reclamation will be delayed by CBM discharges unless water can be diverted or pumped around mines. The EIS must discuss the effect of the large amount of water discharged by CBM operators on the mines and the potential mitigative measures.

CONCLUSION

The members of GACMO believe that it is of paramount importance to the State of Wyoming, the general public, local landowners, and industry that the completed EIS accurately and objectively depict the cumulative impacts of coal bed methane production from the Wyodak coal seam. We therefore request that:

- The groundwater model in its current form must be rejected and a new model constructed. The model must accurately depict the geology of the eastern Powder River Basin. The available information (structures, pumping test information, mine plans, etc.) must be included in the model. The model must be calibrated for the coal to known water level information. Modeled overburden water levels should closely match existing data. The mines' have already set a standard for calibration that should be met or exceeded in their vicinity.

  The groundwater model must include a defensible number of wells (i.e. greater than 12,000). The pumping rate of recently developed CBM wells should be researched and the probable pumping rate for a "pod" of wells based on the local hydrologic data. The pump placement point within the typical coal bed methane well must be researched. Long term recovery plots must be developed and a time for complete recovery of the coal aquifer must be given. The units must be kept similar (preferably standard rather than metric) and maps, with legends, must be presented at the same scale.

  Following completion of the new groundwater model, it must be presented to the public for technical review and a comment period allowed.

- The text descriptions in the EIS should match the presented information. Statements such as "reasonable" or "close" need to be backed up by similarly accurate findings. The EIS should, therefore, objectively describe the findings of EIS related studies and list the full potential environmental consequences of coal bed methane production.

- The EIS must include the number of wells possible and the cumulative environmental impacts of this number of wells. The probable project life must be better determined, especially given the recent history of coal bed methane production.

- The potential effect of coal bed methane production on gas migration towards homes and other structures in the Gillette vicinity should be researched and discussed. This can only be done after a new groundwater model is completed.

- The effect of multiple seam coal bed methane production must be quantified and discussed.

- The effect of coal bed methane discharges causing problems such as erosion, leaching of salts, and winter icing on streams, landowners, and mines must be determined and discussed.

The members of GACMO appreciate the opportunity to comment on the DEIS. Please call me at (307) 687-[illegible] if you have any questions or comments.

Sincerely,

Philip A. [illegible]

Philip A. [illegible]
Chairman-GACMO

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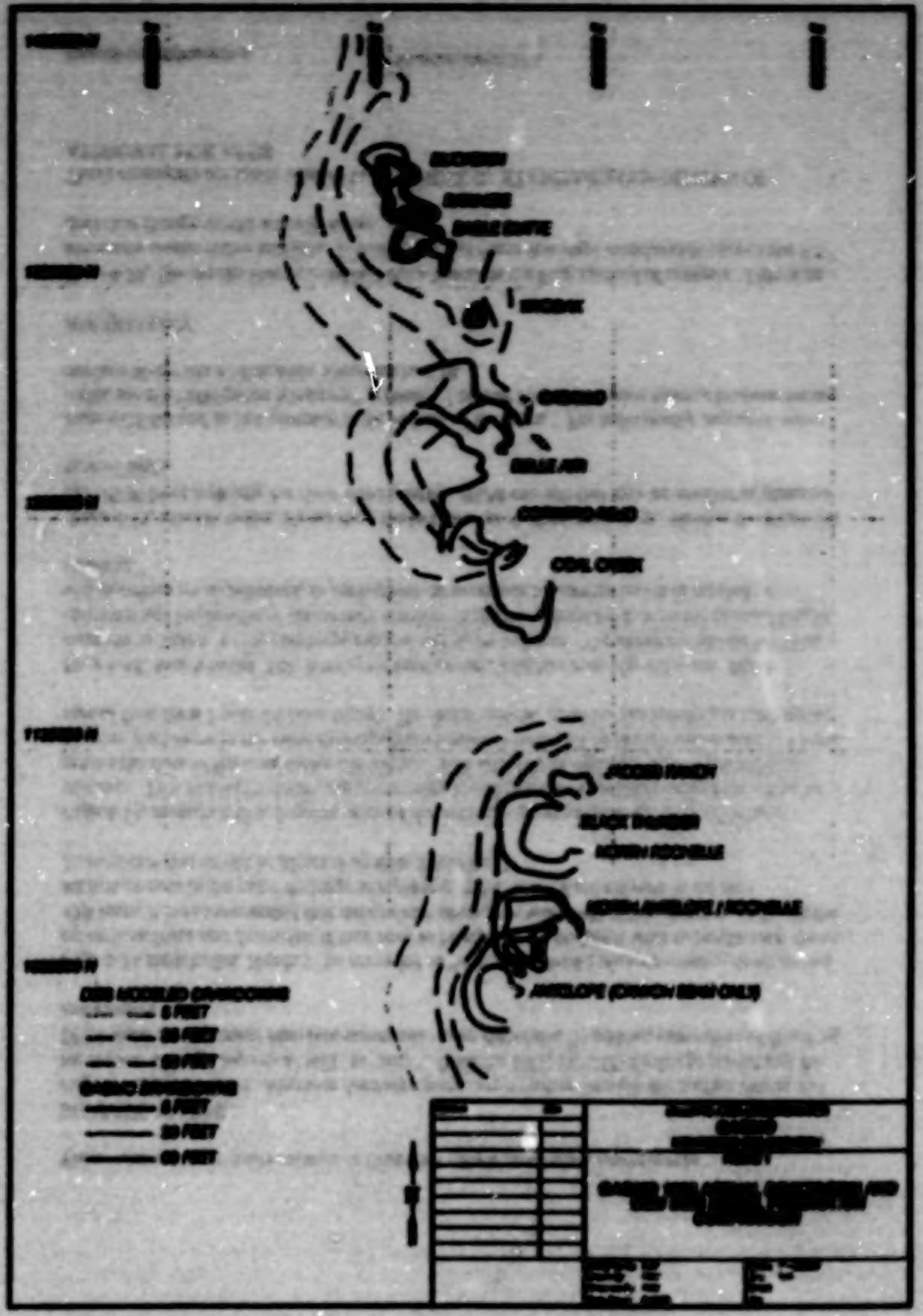

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P. O. Box [illegible], Casper, Wyoming [illegible]
[illegible]

Petroleum Geology
Hydrogeology
Regulatory Permitting and Compliance

BUREAU OF LAND MANAGEMENT
JUL -9 1999
[illegible]

July 7, 1999

United States Department of the Interior
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Attention: Richard Zander

Re: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement Comments

Dear Richard:

The following comments are made on behalf of Yates Petroleum Corporation of Artesia, New Mexico. Yates is a major leaseholder in the EIS study area and has supported this effort both technically and financially. Yates appreciates the opportunity to comment on the Wyodak draft EIS. Yates Petroleum Corporation strongly supports the level of activity proposed in Alternative 1, the Expanded Project Area.

These comments are made relative to Chapter 2 - Proposed Action and Alternatives

HYDROLOGIC MONITORING AND MITIGATION

Page 2-16, fourth paragraph. A maximum limit on the circle of influence (COI) should be one mile. Extending to the next nearest well may require moving out several miles which would certainly be well beyond the circle of influence of a CBM well. Also, it should be stated that if a water well is already covered by a water well agreement from another operator, a second agreement is not necessary as long as the operator closest to the water well has the agreement.

Page 2-17, third paragraph. The reason for GAGMO is that the coal mines do not have water well agreements and the DEQ/LQD Mine Permit requires control of the water levels in an aquifer. CBM is trying to draw down the water in the coal seam just far enough to release the gas. The aquifer will not necessarily be depleted. CBM operators do have water well agreements and thus what is the purpose of FRACMO? Any well affected by CBM activity will be covered by a water well agreement. Yates asks this question to avoid reporting unnecessary data.

Page 2-17, last bullet on the page. It is not possible to get a static water level in areas where wells around the monitor well are pumping. Please recognize that the monitored level would be a working level.

These comments are made relative to Chapter 4 - Environmental Consequences.

SURFACE WATER

Page 4-14, fourth bullet, Alternate discharge points are a matter between the surface owner and the lessee. Change the word "will" to "may". Both the DEQ NPDES discharge permit and the BLM water management plan (see comments under Appendix B) address prevention of flooding and erosion.

Page 4-14 sixth bullet, Needs to be reworded as "operators should observe existing downstream culverts on lease and determine if they need to be replaced with larger sizes to handle total flows. Off lease, it is recommended that the operator attempt to work with other operators and with the surface owners in the same drainage to replace existing undersized culverts in the same downstream that would be affected by their discharge."

Page 4-14, seventh bullet, I am unaware of the authority granted BLM to restrict discharge volumes. This statement denies the opportunity to use reservoirs, or other uses of the water to reduce the flow of the cumulative discharges. Will BLM deny discharges from federal lands because discharges in the same drainage from lands not under BLM jurisdiction exceed the mean annual flow for a 2-year 24-hour storm? The intent may be good but the wording is inadequate.

Page 4-15, fourth bullet, This item again implies the BLM has authority off lease. BLM authority is limited to the discharge method and point on lease. The statement should be "The operators and landowner or lessee may consider irrigation diversions to increase channel length and in-stream impoundments, as appropriate, as measures to address issues of erosion or flooding."

Page 4-15, seventh bullet, Please drop the last statement of the paragraph. Neither the BLM nor the USGS have authority for river water quality. BLM can ask that they be notified of plans on federal lands.

Page 4-35 Second to last sentence at the bottom of the page. " For individually impacted water wells, see the "Mitigation Measures" section." I cannot find this section relative to groundwater. Surface Water has a Mitigation Measures section.

AIR QUALITY

Page 4-75, The results shown in table 4-9 are based on the Plug method of analysis. This is an extremely conservative analysis. It is doubtful that those few days calculated to exceed the 0.5 deciview change would actually occur.

These comments are made relative to APPENDIX B, STANDARD CONDITIONS OF APPROVAL FOR APDS

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Page 2-4 Item 2. Yates agrees in the need for watershed management and for off site mitigation where reasonable and fair. This agreement does not [illegible] non-jurisdictional lands for BLM. Yates does not believe that BLM has authority to make APD approval dependent on the enrollment of non-jurisdictional lands in the water management plan. Approval of any "hydrologic watershed analysis" will certainly exceed BLM's approval to non-jurisdictional lands.

Monitoring plans must be limited to BLM jurisdictional lands. Inspection of private lands is between the owner and the operator.

Page 2-4, Item 4. If the surface is privately owned, a Class III cultural inventory may not be possible if the landowner objects.

Page 2-4, Item 5. The private surface owner may dictate a seed mixture.

These comments are made relative to Appendix D - Water Well Agreement

Yates agrees that a water well agreement is right and reasonable as part of potential damage mitigation. Yates offers this type of agreement to all owners on all type of mineral leases. Yates believes that to make the agreement a requirement in order for BLM to approve an APD for private wells that exist on non-jurisdictional lands (off federal minerals and/or surface) exceeds BLM's authority.

Respectfully Submitted,

[illegible], Regulatory Agent For Yates Petroleum Corporation

Copy: Kathy Porter, Dennis Stallings, [illegible] Norton, Yates Petroleum Corporation

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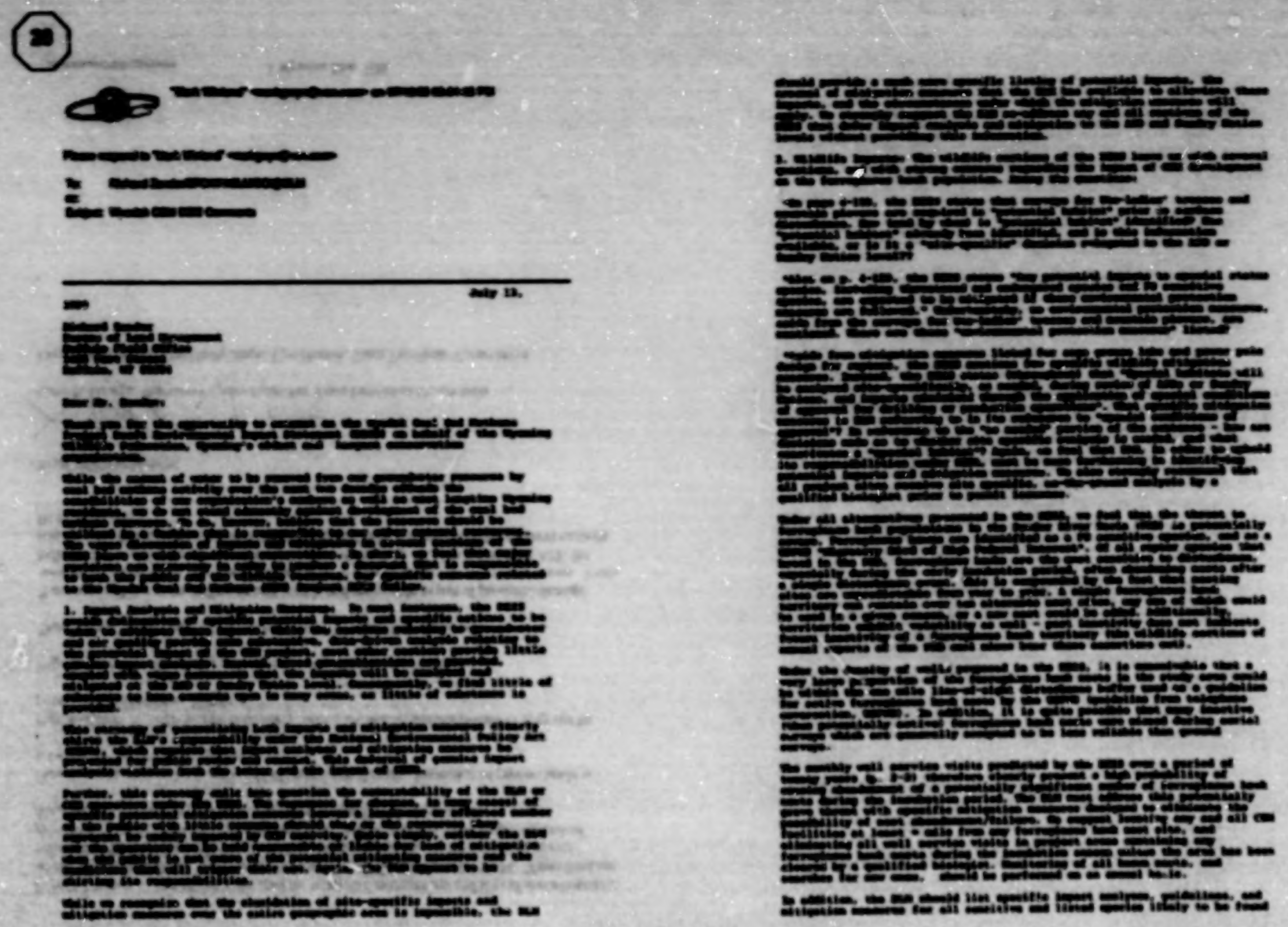

July 13,

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in the study area.

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4. [illegible]

5. [illegible]

[illegible]

[illegible]
Board of Directors
Wyoming Wildlife Federation

Wyoming Wildlife Federation
P.O. Box [illegible]
Cheyenne, WY [illegible]

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[illegible]
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TRUE OIL COMPANY

[illegible]

BUREAU OF LAND MANAGEMENT
[illegible]

July 13, 1999

Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

RE: Wyodak Coal Bed Methane Project Draft EIS Comments

Dear Mr. Zander:

True Oil Company offers the following comments for BLM consideration regarding the above referenced draft Wyodak EIS.

Specific Monitoring Activities - Groundwater (Page 2-17)/Surfacewater (2-23)

Numerous monitoring data are required to be submitted to BLM. In most cases, this data will be primarily collected and submitted to satisfy other agencies (WSEO, DEQ, and WOGCC) permit requirements. As an operator is already submitting, for example, water quality discharge information to DEQ as part of a NPDES permit, the operator should not be required to duplicate he effort and provide BLM separate copies. What is the purpose of BLM collecting all of this type of information? How will BLM use this data? As water quality is the responsibility of DEQ and water quantity is the responsibility of WSEO, the purpose of BLM also collecting this information is questionable. The BLM, WSEO, DEQ and WOGCC should work together to share the collected information rather than requiring all operators to provide with redundant information.

It is also confusing to include in the draft EIS different agencies permit requirements. Given the dynamic nature of other agencies permit requirements, BLM should not be including within this section "expected" or "possible future" permit conditions that another agency may be considering. For example, recent permits received from the WSEO do not include a requirement for bottom hole build-up pressure tests as referenced in this subsection. This section should clearly state that agency requirements vary on a case-by-case, permit to permit basis instead of attempting to reference conditions that may or may not apply.

BUREAU OF LAND MANAGEMENT
[illegible]

Mitigating Measures (Page 4-14)

As described in the draft EIS, the development and implementation of a water management plan will be addressed through a committee type process. The water management plan should be landowner and operator driven and designed to ensure that BMP's are met. The proposal as described creates a study in land and water management by a variety of agencies and special interests that do not have jurisdiction on this issue. The creation of such a committee will likely guarantee failure of the proposed project. BLM should remember that for the most part, the federal mineral leases are overlain by private surface. These lands are not public lands whose management is decided in the public process. The primary responsibility of land stewardship should rest on the individual(s) that direct and appropriate the water. In this case, resource management should remain the responsibility of the individual parties, and not be directed by committee.

Socio-Economics (3-43 & 4-104)

The overall tone of these sections is extremely negative and misleading. These sections fail to discuss the economic benefits the local area, or the State of Wyoming will experience during the 20+ years that drilling, and production will occur. The focus should not be on the end of the project, it should instead describe both the positive and negative socio-economics of the project through the entire 20-year analysis.

It is stated on page 4-115 that "Socioeconomic impacts resulting from CBM development are a major concern because considerable energy-related development has occurred in and around Campbell County during the past 30 years." However, it is unclear from the text what the "concern" is. Campbell County is quite prepared to absorb any increased activity or population resulting from the CBM play. If such a warning is to be included in the document, it should be supported by facts and figures.

Appendix D - Standard Conditions of Approval for APDs

Operators are required to provide water management plans (WMP) for each well as part of an APD application. As CBM wells are typically developed in "pods", with the "pods" linked to NPDES discharge points, requiring a WMP for each well is unreasonable and an inefficient use of operators limited resources. It is suggested that WMPs be prepared on a field, a "pod" or a discharge basis instead of on a well by well basis. As the permanent plan must look at the entire watershed area, operators should not be required to piece it together on a well by well basis.

Except for the inclusion of a topographic map, all seven of the items required to be addressed in a temporary WMP are more conditional in nature than informational. As examples, "only surface piping is allowed...", "prior to any discharge of water, a water quality analysis must be submitted", "water energy dissipation measures must be designed and utilized". It is suggested, these seven conditions instead be included as conditions when the APD is issued, and the requirement for a temporary WMP be deleted.
Water quality information is required to be provided to WQD. What is the purpose of BLM requiring this information as well? Data should only be collected by the agency that is responsible

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for that resource. It is again suggested the operator share the information with our regular operators to submit the same information to multiple agencies. Collecting data for the sake of collection serves no useful purpose.

Appendix D - Water Well Agreement

Item 1 of the agreement states a producer must test for the presence of methane in water in accordance with the attached test procedures. No test procedures are attached. What is the purpose of the testing? Is an operator testing for methane in the well casing or in suspension within the well water? Guidance on the purpose of the testing should be included.

The producer is required to establish a continuing water well monitoring program. However, no guidance on frequency and content of the program is provided by BLM. It seems that sufficient monitoring is already required by other agencies and there is no need for this condition.

Operators should have the flexibility and freedom to develop their own water well agreement with a landowner. Specific issues should be left for negotiation between the parties and not prescribed by the BLM. Inclusion within the EIS document of an example water well agreement that describes the minimum acceptable components is appropriate. However, it should be made clear in the EIS that Appendix D is strictly an example with suggested minimum acceptable components of a water well agreement.

General Comment

The document fails to point out that CBM development is an evolutionary process that occurs from start to finish, gradually and continuously over time. All of the proposed 3900 ± wells will not be drilled, completed, produced and abandoned instantly. Therefore, the impacts (both positive and negative) from the proposed project will increase and decrease gradually over time. There is a negative bias in the tone throughout the entire document. The purpose of an EIS is to provide a balanced discussion of the positive and negative impacts of a project. The overall tone and text of the document should be revised to reflect a balanced portrayal of the issues, benefits and impacts.

Thank you for the opportunity to provide comments.

Sincerely,

Renee Taylor

Renee Taylor
Environmental Coordinator

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Enron Oil & Gas
Company
[illegible]
Denver, CO [illegible]
[illegible]
Fax [illegible]

July 9, 1999

BUREAU OF LAND MANAGEMENT
JUL 13 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

RE: Comments for Wyodak Coalbed
Methane EIS

Ladies and Gentlemen:

Enron Oil & Gas Company ("Enron") appreciates the opportunity to review the captioned EIS and provides the following comments:

1. Enron and its partner, Coleman Oil & Gas, Inc., own federal and fee leases in Township 42 North, Range 77 West; Township 43 North, Range 76 West; Township 41 North, Range 75 West; and Township 43 North, Range 75 West, where we are attempting to establish coalbed methane production through a five well pilot program in Section 23, Township 43 North, Range 75 West. We strongly support the approval of the subject EIS for the Alternative Project Boundary.

2. Enron is concerned that the staffing needs for the Bureau of Land Management to timely process future APD's is both understated and underestimated. We believe that a thirty day turnaround should be a firm target and that a staffing plan should be developed to meet that turnaround time.

3. The EIS projects future natural gas production from coalbed methane development in the study area but does little to examine changes in natural gas supply from other areas of North America and increases in North American natural gas demand. Enron operates 2000 wells in the greater Green River Basin and knows all too well what decline rates have done in the past three years to diminish our daily production volumes. The recent depression of worldwide oil prices led to historic lows in nationwide rig activity. Enron feels strongly that the delicate natural gas supply/demand balance that exists in North America is in jeopardy due to increasing demand and diminishing supply. The development of natural gas new reserves will be very important to ensure adequate supplies to residential and industrial consumers. This EIS needs to consider the positive/negative impacts on our domestic North American natural gas market associated with project approval/denial.

Natural gas. Electricity. Endless possibilities.

Mr. Richard Zander
July 9, 1999
Page 2 of 2

BUREAU OF LAND MANAGEMENT
JUL 13 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

4. The EIS assumes that produced water will most likely be discharged into local drainages and thereafter allowed to contribute to local hydrology as would any other runoff. No consideration or analysis seems to have been made for reinjection on a local or regional basis. The effect of reinjection on coalbed aquifer drawdown and recharge should be included in the EIS.

Thanks again for the opportunity to provide these comments.

Respectfully,

ENRON OIL & GAS COMPANY

Ty Stillman

Ty Stillman, CPL
Project Landman

TS/[illegible]
17510T

Natural gas. Electricity. Endless possibilities.

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Thunder Basin Coal Company

BUREAU OF LAND MANAGEMENT
JUL 13 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Mr. Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Re: Comments to Draft EIS Wyodak Coal Bed Methane Project 1793 (930)

Dear Mr. Zander:

Enclosed are the comments of Thunder Basin Coal Company, L.L.C. in response to the above referenced draft environmental impact statement. In addition, Thunder Basin joins in the comments filed by the Wyoming Mining Association, and the Gillette Area Groundwater Monitoring Organization.

Standard of Review

As the BLM has stated, "[i]n considering whether to approve APDs, the BLM must consider the possible project-specific and cumulative environmental impacts to ensure compliance with the National Environmental Policy Act of 1969 (NEPA). This draft EIS was prepared to meet that requirement." (DEIS 1-1) In construing NEPA, the Supreme Court has expressed the purposes of the act in similar terms.

NEPA has twin aims. First, it "places upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action." *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519 at 553, 98 S. Ct. 1197, at 1216. Second, it ensures that the agency will inform the public that it has indeed considered environmental concerns in its decisionmaking process. *Baltimore Gas & Electric Co. v. NRDC*, 462 U.S. 87 at 97; 103 S. Ct. 2246, at 2252 (1983).

In order for the current DEIS to meet the requirements of the law and form the basis of a final EIS that will support the recommended decision of the BLM, the agency must respond to the substantive comments offered by the public (30 CFR §1503.4). Only by responding to these comments can the agency meet its obligation both to consider "every significant aspect" of the potential impacts, and to ensure that the public has been informed of those environmental concerns. Thunder Basin Coal has identified the following issues, which either are incorrect in their analysis or inadequate in the environmental significance which has been ascribed to them. It offers the following substantive comments to those issues that it hopes will be addressed in the final document for the purposes of completing a valid EIS.

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BUFFALO, WY

The draft EIS document raises issues regarding potential conflicts between energy development interests. The EIS contains the following statement at page 4-3:

> "Conflicts between CBM drilling and existing or potential surface coal mining may occur. Development of CBM wells should be precluded in areas of active or impending coal mining. Locating wells in areas where future mining may take place would preclude mining during the life of wells located in the proposed mining area. Coal in these areas would be mined after CBM extraction is completed or terminated, or after an agreement is negotiated between the CBM operator and the coal mine operator."

This language fails to consider all alternatives and to complete a social economic impact analysis as required by NEPA on BLM's apparent policy decision to prohibit surface coal mining from expanding into areas where coal bed methane production may be occurring. Based upon the broad geographic application of this EIS and the projected CBM development thereunder, such a prohibition policy could in fact prevent any and all expansion of all existing surface coal mine operations within the Powder River Basin, until such time as the coal bed methane has been extracted.

BLM should conduct the requisite social economic impact, which would appropriately take into consideration the relative economic impacts to federal, state and local economies of the financial gains realized from both surface coal mining and coal bed methane extraction.

BLM should not utilize the EIS to adopt an apparent policy regarding surface coal mining and coal bed methane extraction.

Independent of the EIS process, BLM should develop comprehensive guidelines that recognize (1) the relative economic values in the production of coal and the production of CBM, (2) the relative values of the investments heretofore made and hereafter to be made by the coal mining operators and the CBM operators.

Comments to Draft Environmental Impact Statement

Authorizing Actions (Page 1-3)

This discussion is misleading and inaccurate. It confuses two related but separate issues: the ownership of coal bed methane (CBM) and the disposition by the BLM of that resource to a private party.

The Supreme Court has decided that the reservation by the United States of "coal" under

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land patents issued for the surface of lands under two statutes, (Coal Lands Act of 1909, 35 Stat. 844, 30 USC §81, the Coal Lands Act of 1910, 36 Stat. 583, 30 USC §§83-85) did not contain within the reservation the CBM which occurs naturally in the coal. *Amoco Production Company v. Southern Ute Indian Tribe*, No. 98-830 (June 7, 1999). This means that any person who patented lands under the 1909 or 1910 Coal Lands Acts received within the title of the patent the ownership of the oil and gas in those patented lands. This also means that an oil and gas lease granted by a surface owner of those substances is valid on its face, including as noted in the EIS, any claim of ownership of the CBM by the United States, (P.L. 105-367).

This significance of this recent decision, however, is not accurately portrayed in the EIS discussion. First, a minority of the area within the project area described in the EIS was patented under either the 1909 or 1910 Acts. A larger percentage of lands was patented under the 1916 Stock Raising Homestead Act which reserved to the United States unequivocally both the oil and gas (including CBM) as well as the coal. Second, even land that was patented under the 1909 and 1910 Acts was frequently reacquired for mineral purposes under the Bankhead-Jones Act in the 1930's and thereafter. This means that the right to lease CBM may be the legal right of the United States and not the surface patentee. For that reason, the description of the federal oil and gas ownership constituting 59% of the proposed project area may be inaccurate.

The second inaccuracy in the description of the authorizing actions is that CBM, "currently is leased by the federal government as an oil and gas right." As the draft EIS notes in the next paragraph, the 1981 Solicitor's Opinion which concluded that the CBM was encompassed within a federal oil and gas lease was withdrawn by the Solicitor prior to the submission of the Interior Department's brief in the *Southern Ute* case. Therefore, it is not clear as a matter of current BLM policy if outstanding oil and gas leases do or do not include the CBM. Whether any outstanding federal oil and gas lease may be developed for CBM is a matter of factual inquiry as to the legal status of the lease.

Recommendation: Revise this section of the document to describe more accurately the legal content of the BLM's actions.

Surface Water (pages 4-8)

- Increased surface water flows may alter, but not necessarily improve the water quality. The high alluvial ground water salinity (actually over 30,000 mg/l TDS in many cases) and salinity of adjacent rock units may leach salts. While much is made of the capacity of major streams to handle CBM water, the CBM users are actually using minor ephemeral streams in many cases to discharge waters increasing the potential for leaching of salts and erosion. Due to low initial sediment content, CBM discharge water has much erosive potential. What requirements will be in place to correct salinity and erosion problems occurring on streams due to CBM discharge waters?

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- Most of the coal mines have upstream large flood control structures. These structures are designed to capture the occasional storm or snow melt event. Mines will face considerable difficulty pumping water on a daily basis to keep these reservoirs available for flood events, in addition to dealing with potential sediment loading of these structures. This needs to be included in the impacts due to the pumping of CBM produced waters. It should also be mentioned that stream reclamation will be delayed by CBM discharges unless water can be diverted or pumped around mines. The EIS must discuss the effect of the large amount of water discharged by CBM operators on the mines and the potential mitigative measures.

- Pages 4-1 and 4-2 of the draft EIS states that "CBM development occurring upstream from nearby surface coal mines could affect coal mining operations. CBM generated water discharged upstream from coal mines could increase surface flows in the vicinity of coal operations or decrease the rate of groundwater withdrawals that currently accompany ongoing coal mining operations. There likely will be impacts to sediment structures in the coal mine permit areas. These structures have been designed to accommodate historical flow rates that do not include contributions from CBM generated flows. Some design aspects of mining operations may need to be changed. Any required revisions to approved mine plans would impact operators and agencies involved in reviewing proposed changes."

This discussion implies several disturbing and unrealistic assumptions. First, that coal mine operation sediment control ponds will accept CBM discharge runoff. Second, that coal mine operations will change some structural designs to accommodate CBM discharges. Third, that coal mine operators and related regulatory agencies will conduct coal permit changes to accommodate CBM activities and discharges. These assumptions raise clear questions of trespass, offsite damages and illegally imposed burdens. BLM must revise this section by removing these assumptions or by adding clear directions that CBM operators must obtain appropriate landowner consent prior to any discharge, to address any and all of these projected impacts.

Groundwater (4-17)

- Comments submitted July 6, 1999, by the Gillette Area Groundwater Monitoring Organization have identified numerous concerns regarding the insufficient model calibration, inaccurate modeling parameters, and inappropriate assumptions in the groundwater models and results of the draft EIS. The review by that group resulted in a determination that the EIS groundwater model must be rejected and a new model constructed to address several deficiencies. TBCC concurs with these points of concern, and agrees that BLM must address them through remodeling prior to finalization of this EIS process.

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factor used for coal mining blasting activity in the air quality model was based on a small number (about 20) of test shots conducted by the Bureau of Mines in 1994 ([illegible]) to simulate underground mine conditions. This study used a straight ammonium nitrate and fuel oil mixture, which ranged from 0 to 20% fuel oil. The EPA stated in the AP-42 that "Any estimate of emissions from explosives use must be regarded as approximations that cannot be made more precise". Due to technological advances, emulsions, slurries, fuel oil and ammonium nitrate mixtures commonly used in the Powder River Basin because it is more energetic than the older straight ammonium nitrate and fuel oil mixture. The explosives described in the AP-42 for ANFO are not the same explosives used today. Many explosive manufacturers believe the AP-42 is too conservative to be used for ANFO emulsions. In lieu of a more accurate emission factor, there should be some qualifying statement in the EIS that addresses the possible over estimating and inaccuracies in the emission factor used.

- One of the stationary sources that is probably included in the post-1988 inventory is the proposed Two Elk Power Project. This plant would be one of the most advanced plants in the United States, boasting flue-gas desulfurization (FGD) for SO_2 control and Selective Catalytic Reduction (SCR) for NO_x control. Further electrification of equipment in the PRB, which is supplied by highly controlled power plants (such as the Two Elk Project), will also help reduce unit emissions in the region. In permitting of this project, none of the state or federal regulatory agencies showed visibility impacts.

The purpose of the preceding discussion was to demonstrate that the estimates in the DEIS are representative of a WORST CASE analysis. Again, this needs to be highlighted in the FEIS.

Visibility Monitoring

The DEIS discusses visibility at eight wilderness areas, national monuments and national parks. Of these, only two are federal mandatory Class I areas (Badlands and Wind Cave) which merit specific protection under Section 169 of the Clean *Air Act* (visibility program). The other Class I and Class II areas appear to be included for general discussion. The FEIS should clearly denote the regulatory difference and level of protection afforded the areas.

Of the Class I/Class II areas identified, only one (Badlands) has an accurate visibility monitoring record. Data collection began at the Badlands Class I area in 1988. Figure 1 depicts $PM_{2.5}$ (fine particulate) concentration and visibility at the Badlands monitoring site. The graph was obtained from the IMPROVE network database maintained by Colorado State University. The graphs are depicted in a single year (upper) and cumulative year (lower - 3-year rolling average). The graphs show that the best visibility days (Group 10) have been steadily improving

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Corresponding emission rates are thereby significantly exaggerated, considering the ever predictive modeling efforts.

- In a Memorandum dated 1/12/00, the EPA suggests that modeling of Locomotive Emissions should include emission reductions resulting from new federal standards for both NOx and PM10. These reductions range from 2.5% in the year 2000 to 45.3% for years 2010 and later. The draft EIS acknowledges on Page 4-[illegible] that modeling did not account for the 45% decrease in locomotive NOx emissions. By not using these EPA Air Quality Guidelines, the emissions associated with coal transportation are significantly exaggerated. The authors should explain why this EPA guidance was not considered.
- Advances in existing haul truck technology has resulted a trend were the same technology used in locomotive engines is used [illegible] haul trucks. There are many of these trucks already in the Powder River Basin. NOx and PM10 emission reductions similar to the EPA guidance mentioned above should be used in the modeling of diesel emissions from mine haul trucks. In addition, most PRB mines have been using ever larger haul trucks to move overburden and coal. When the mines were first opened, the standard was 100-ton haul trucks. Currently, the standard is in the 170-240 ton range. The Black Thunder Mine is now on the cutting edge of technology, running a fleet of 360-ton haul trucks. This represents a 50% productivity increase per unit of material moved from a 240-ton haul truck, and a 112% productivity increase from a 170-ton haul truck. The new trucks are also being built with higher efficiency, lower emission engines. This trend will continue throughout the Powder River Basin.
- The PRB mines are also increasing the size of their earth- and coal-moving equipment. Shovel capacities are now in the 70 cubic yard (cy) range, nearly double what was considered the norm only a short number of years ago. The Black Thunder Mine is also in the process of erecting its fourth dragline, with a bucket capacity of approximately 130 cubic yards. The current fleet of draglines have bucket capacities of 45, 90 and 140 cubic yards. This addition will mean that more material can be moved per unit of energy expended. The shovels and draglines are all electrically driven machines, and this equipment (particularly the draglines) displaces equipment that burn diesel fuel. Since the source of power is currently obtained from northeastern Wyoming (primarily) from highly controlled power plants, NO_x and SO_2 emissions are minimized or even eliminated from the region. It is reasonable to assume that the mines in the PRB will continue to increase productivity/efficiency through the 2015 period, and that unit emissions will continue to decrease.
- ANFO is a generic term used to describe a wide range of high explosives that consist of Ammonium Nitrate, Fuel Oil, Additives, and Emulsions (ANFO). The AP-42 emission

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over the period (with one spike in 1990). On the average (Group 50), visibility is better now than in 1988. Visibility on the worst days (Group 90) has been relatively steady to slightly decreased over the period. While the National Park Service has expressed concern that visibility on the worst days isn't showing steady improvement, the overall data cast question on the DEIS conclusion that operations in the PRB are significantly impacting visibility in the Badlands Class I Area. During the 1988-1996 period (1997 data could not be developed in the short time allowed for comment), coal production in the PRB increased from [illegible] million tons to 257 million tons (see Table 1), while overall units moved (coal plus overburden) moved from 345 million units to 502 million units.

The question then becomes what is the source of the visibility impairing emissions that impact visibility in the Class I areas. The conclusion from the CalPuff model that the PRB is a significant source of visibility impairing emissions is suspect. However, it is recognized that the modeling effort did not allow sufficient time or resources for "ground truthing" the model with actual monitoring data, as it is contained in databases that are very difficult to manipulate and analyze in a reasonable amount of time.

The National Park Service has developed graphics that show the source of visibility impairing emissions to the Badlands Class I Area (Figure 2). While the PRB is included on this figure, the source of emissions includes much of the conterminous U.S. and portions of Canada. The graphic recognizes that visibility impairment is a regional issue and that the depiction of impacts solely from the PRB is meaningless.

The presentation of the conclusions in the DEIS is also subject to question. The U.S. Environmental Protection Agency (EPA) and the NPS base their evaluations of impact based on no degradation in the average of the 20% best and improvement in the 20% worst visibility days each year. The depiction of impacts on a daily basis is questionable from a modeling standpoint, at best, and inconsistent with the current regulatory framework.

The bottom line is that the discussion of visibility impacts from the PRB is very questionable, and irrelevant under the current regulatory framework (see the following discussion). This should be clearly noted in the FEIS.

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Figure 1

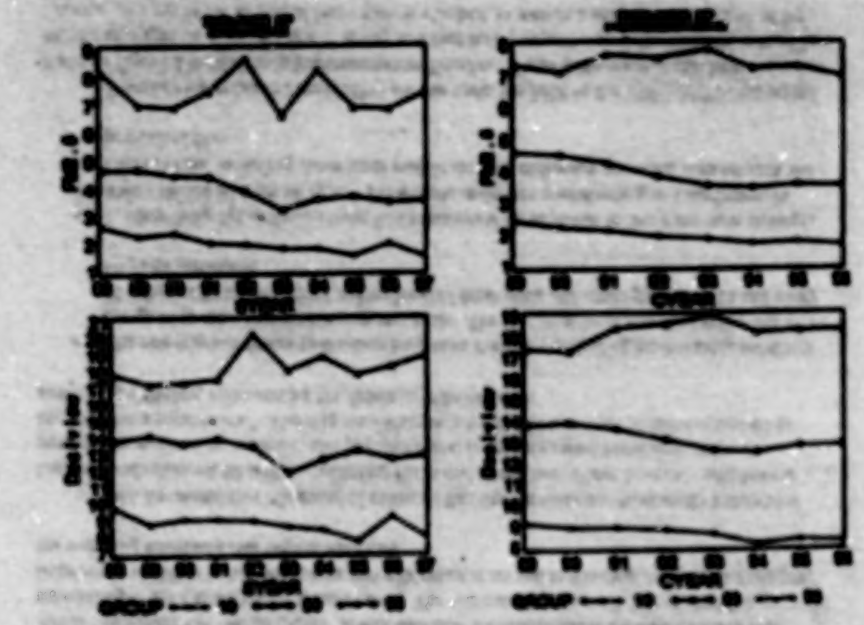

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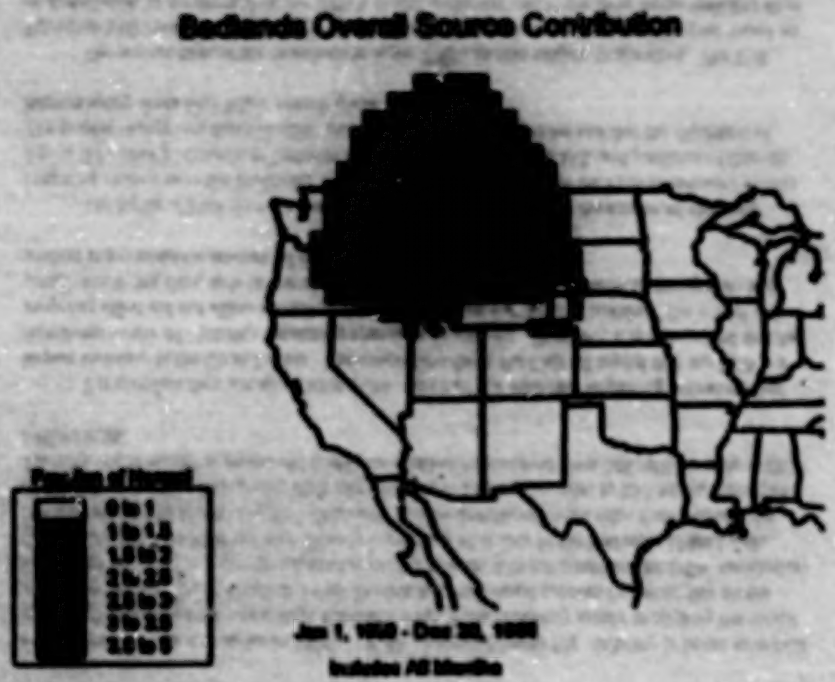
Figure 2



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Regional Haze Program

On April 22, 1999, the EPA issued the final Regional Haze Program (RHP) rules. The purpose of this program is to protect and enhance visibility in the 156 mandatory federal Class I Areas throughout the United States. It will also have a commensurate benefit to other non-mandatory Class I and Class II areas as well. The rule mandates that all States establish goals for improving visibility in national parks and wilderness areas and to develop long-term strategies for reducing emissions that impact visibility.

EPA has stated that "Because of evidence that fine particles are frequently transported hundreds of miles, all 50 states – including those that do not have Class I areas – will have to participate in planning, analysis, and in many cases, emission control programs under the regional haze regulations." The Regional Haze rule represents a comprehensive approach to managing visibility, and contains the following requirements:

- The rule requires States to develop long-term strategies including enforceable measures designed to meet reasonable progress goals. The first long-term strategy will cover 10 to 15 years, with reassessment and revision of those goals and strategies in 2018 and every 10 years thereafter.
- In identifying the emission reduction measures to be included in the long-term strategy, States should address all types of manmade emissions contributing to impairment in Class I areas, including those from mobile sources, stationary sources, area sources and prescribed fires.

State Implementation Plans (SIPs) are due under the RHP in the 2003-2008 time period. Refer to Figure 3 for the State Implementation Timeline. These SIPs must detail how emissions will be managed in order to achieve steady and continuous improvement in visibility in the Class I Areas. A copy of the Regional Haze Rule is attached, as well as a graphical depiction of the implementation schedule.

The FEIS needs to clearly acknowledge this newly promulgated program, and recognize that there is a program and process in place to manage visibility. The reader cannot be left with the impression that visibility will necessarily be impacted by economic growth in the PRB, and that development can be managed in conjunction with visibility concerns throughout the region. The FEIS and the Record of Decision should contain NO specific mitigation requirements relative to visibility, as this type of action would pre-suppose the outcome of the required State Implementation Plan developed under the Regional Haze program. The FEIS also needs to conclude that the visibility impacts discussed in the DEIS are WORST CASE.

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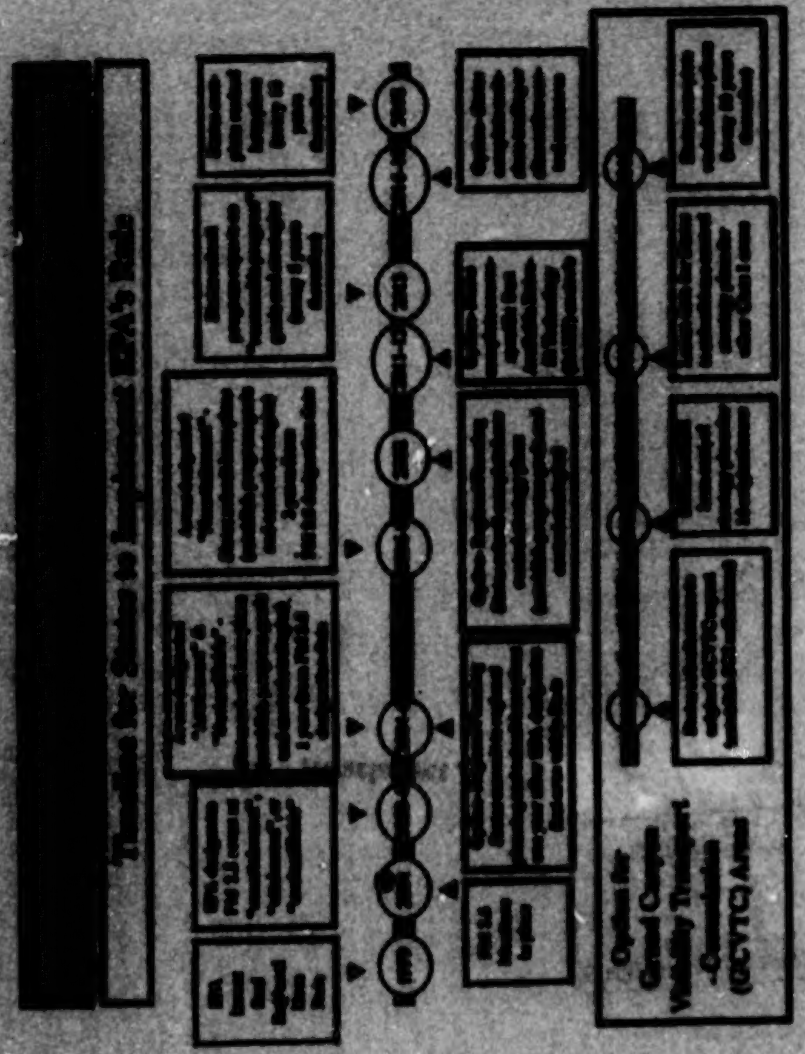
Figure 3


Timeline for States to Implement EPA's Rule
Option for Grand Canyon Visibility Transport Commission (GCVTC) States

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Most of the issues appear [illegible] related to the lower levels of accuracy and refinement for coal related sources. Given [illegible] for proposed coal bed methane actions, the reduced attention to accuracy and detail for coal mining and transportation activities is somewhat understandable. However, the [illegible] projections of coal-related impacts [illegible] these [illegible] considerations [illegible]. These results are [illegible] in the report as equivalent to those derived from [illegible] more refined coal bed methane [illegible], establishing a basis for equivalent validity and interpretation. This is completely unacceptable. It is incumbent upon BLM to ensure that the published results in the EIS do not provide a basis for misinformation or misinterpretation. Coal related impacts must be completed with equivalent refinement and accuracy.

Thunder Basin Coal appreciates the opportunity to have provided these comments.

Sincerely,

Paul A. Lang, President

attachment

cc: Blair Gardner
Senior Counsel
Arch Coal Inc.

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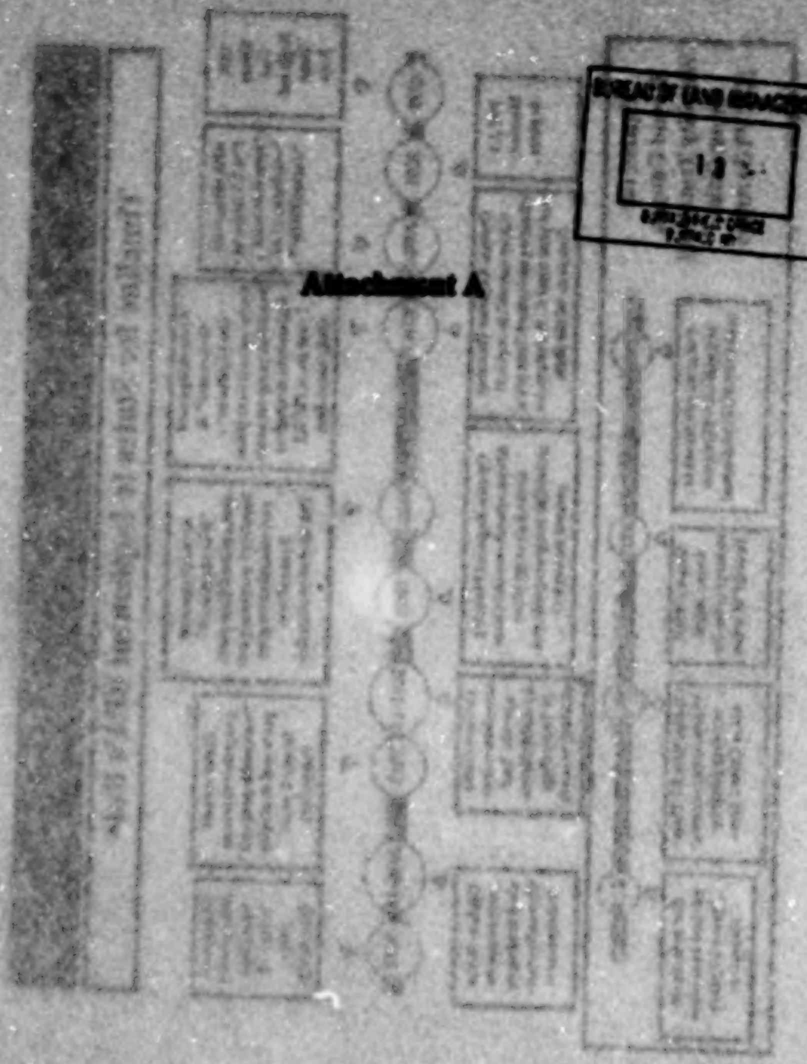
Attachment A



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federal register

Thursday
July 1, 1999

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Part II

Environmental Protection Agency

40 CFR Part 51
Regional Haze Regulations; Final Rule

The complete final rule was attached to this comment letter and is incorporated by reference.

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TO: Richard Zander – Bureau of Land Mgmt
Buffalo Field Office
Buffalo, Wyoming 82834

From: Richard L. Jones
1905 [illegible] Street
Casper, Wyo 82604

Subject: Comments concerning Methane Gas Development.

I see serious disregard for the rights of Wyoming citizens who have Coal Bed Methane production activities upon their property and upon agriculture leases. My concerns are in three areas.

1. Water Rights
2. Waste of Wyoming Water
3. Pathetic simplicity of thinking concerning the economics of the alternate use of water.
4. Land damage done by discharge of water.

I offer the following reasons for my objections to the State's use of Coal Bed methane water management.

1. I understand that if a water well is made useless by the pumping out of Coal Bed water, any [illegible] given to the affected land owner, relies on a very inferior current water right. This is absolutely outrageous. Must be changed!

9-13-99 2 of 2

1. (contd) If a water right is damaged, it must be replaced or compensated.

2. Water is a resource of infinite value. You must not pump it out and then propose fairy tale uses of absurd economic questionable value. No fairy tales allowed! Solid, proven economics or no deal!

3. In the 1950's & 1960's American genius gave Afghanistan irrigation systems. These systems rapidly turned existing farmland into an [illegible] of all. The land died of Alkaline destruction. Already you are creating Alkali flats and noxious weed fields. The waste of Wyoming water to create Alkali is not acceptable!

4. You have massive mitigation problems which have been neglected and they must be solved.

Your present Coal Bed Methane Program can be compared to Ghengis Khans Economic Program for Eurasia and Northern Europe in the years 1170 to 1227.

He Came, He Saw, He took, and left a big mess!

Richard L. Jones

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840 Kimberly Ct.
Lander, WY 82520
July [illegible]

BUREAU OF LAND MANAGEMENT
JUL 14 1999
[illegible]

Mr. Richard Zander
BLM, Buffalo Field Office
1425 Fort St.
Buffalo, WY 82834

Dear Sir:

I wish to comment on the Wyodak Coal Bed Methane Project.

It seems to me that the development of methane from coal beds in the Powder River Basin is the search for quick riches without adequate consideration of the long term consequences. A land is being sacrificed to the god of mammon for generations to come.

What is being pushed in the Powder River Basin is an impending catastrophe of immense proportions. The impacts on naturally occurring aquifers and whole land ecosystems is completely unknown. The waste of valuable fresh water should be considered intolerable. When the water is gone, 10, 15, or 20 years hence, who or what is going to be able to inhabit such a waste land? These are naturally dry, arid lands at a relatively high elevation.

What kind of mitigation will indemnify landowners for the loss of their lands and their income?

What happens when the water and the gas are taken and the earth begins to subside? Is there any anticipation of huge fires in the coal still remaining? There is ample evidence of once-huge subterranean fires one of which created the large, deep hole now occupied by Lake DeSmet.

There is a phenomenon now documented at and near Durango, Colorado, in which methane seeps to the surface when water is removed. The seeping methane has made houses uninhabitable, has killed trees and other vegetation, and has killed animal life. Is there any consideration of this type of effect over a large area? The relatively small effects of seep may already have raised their ugly heads at Rawhide Village near Gillette, and at Decker, Montana.

What about the wildlife? The EIS clearly sets out that wildlife will be affected. How can there be mitigation for loss of entire wildlife populations?

This whole project is being rushed without knowing the full and absolute consequences of area-wide effects. What will the cumulative effects be, not only on the Powder River Basin but on the entire state? Taken in conjunction with the huge natural gas developments in Southwest Wyoming, is Wyoming to be a national sacrifice area? Is unfettered and damaging development for the sake of quick, easy profits to be the fate of Wyoming?

Anytime there is haste there is waste. This whole project portends waste on an unimaginable scale. I hope all involved will use wisdom and good judgment.

Respectfully,

Tom Bell

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[illegible]

POWDER RIVER BASIN RESOURCE COUNCIL
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**Comments on Wyodak Coal Bed Methane Project Draft Environmental Impact Statement - Powder River Basin Resource Council
July 16, 1999**

1. Inclusion of private wells in No Action Alternative:
The EIS examines the impacts of privately owned CBM wells in the Proposed Action section of the analysis. However, the No Action alternative in the EIS includes the privately owned CBM wells in the baseline for a No Action Scenario. The impact analysis includes the privately owned CBM wells in the Proposed Action because drilling of the private wells is proposed for inclusion in the federal action, and is thus connected to the federal action. Because drilling of the privately-owned CBM wells is connected to the drilling of the federally owned CBM wells, they are correctly included in the Proposed Action analyses, but should not be included in the No Action analyses. Either the privately owned well drilling is a connected action or it is not. One of the purposes of the No Action analysis under NEPA is to establish a baseline for analysis. Inclusion of the privately owned wells in both the Proposed Action and the No Action alternative prevents establishment of a true "no action" baseline as contemplated under NEPA. The No Action alternative should not include the privately owned CBM wells in order that an effective baseline can be established. (Note that on page 3-30, the EIS indicates that the mineral estate of lands within the study area is federally owned, at least in part, throughout most of the area - this statement provides additional support for the concept that the action of drilling private CBM wells is connected to the drilling of federal wells.)

2. Deferral of absence of impact analysis:
Throughout the EIS, reference is made to future analyses that will or can be conducted and included in APDs or Sundry Notices, through the application of special conditions of approval for drilling or production, or through future development of unspecified site-specific mitigation measures. The absence of analysis in each case is justified on the grounds that the analysis will or can be performed during review of APDs or Sundry Notices, or as required on a site specific basis. This deferral of analyses negates the purpose of NEPA, which requires that impact analyses and associated alternatives for mitigation be presented to the public for review and comment in an EIS. In each case, potential impacts should be included in this EIS, along with potential mitigation, so that the public has an opportunity to review and comment in accordance with the provisions of NEPA.

The analyses and mitigation alternatives should not be absent from this document or deferred. At a minimum, if it is for some reason impossible to include the analyses and mitigation alternatives in this EIS at this time, then future analyses and mitigation alternatives should be appended to the EIS and circulated for public comment and review, in order that the requirements of NEPA are satisfied. In fact, Appendix [illegible] of the EIS sets out "Standard 'Conditions of Approval' for APDs" that includes provision 1: "The operator is committed to all mitigation measures and monitoring contained in the EA/EIS." For the most part, this EIS does not include mitigation measures, but defers them to some future date or process. Impact analysis and mitigation needs to be included in this EIS so that they are subject to review and comment in satisfaction of NEPA and in order that mitigation requirements can be included in "Conditions of Approval" applied to APDs and Sundry Notice Drilling Plans and Surface Use plans. (See also, page 4-14, "Mitigating Measures")

3. Inclusion of information from related EAs and EISs in Cumulative Impacts section of the EIS observes:
"This EIS is being prepared because companies are proposing new CBM projects outside of previously approved areas or additional drilling in existing fields." At the same time, the Introduction section of the EIS indicates that "[o]ther aspects of the environment have been discussed in . . . " numerous other EAs and EISs listed on page 3-1. If other EAs and EISs must be consulted in order to get a clear impression of the environmental impacts of the Proposed Action, the impacts addressed in the EAs and EISs noted on page 3-1 should be addressed in the Cumulative Impacts section of this EIS in order to avoid segmentation under NEPA. The public should not be forced to piece together numerous analyses from numerous sources in order to glean a clear picture of the impacts and related mitigation under this Proposed Action.

4. Application of water produced by Proposed Action to beneficial use by CBM producer:
On page 1-6 it is observed that : "The State of Wyoming requires water produced in conjunction with CBM development to be put to subsequent beneficial use and requires approved permits from the Wyoming State Engineer's Office (WSEO) to appropriate groundwater or surface water or to impound produced water." However, beneficial use requires that the water producer or user must itself put the water to beneficial use -- beneficial use can not be performed by a party other than the water producer or extractor and the use cannot be speculative. There does not appear to be a specific beneficial use by the producer of the water cited anywhere in the EIS document. For instance, on page 4-11, under "Water Use," the EIS provides that produced water from CBM wells is "most likely to be used for stock watering, fisheries, and irrigation." This section of the EIS also provides that discharged CBM waters "also may be used to create small ponds and reservoirs." These statements do not appear to conform

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to the requirements for beneficial use. In addition, on page 4-68, the EIS provides that "groundwater appropriated as CBM produced water likely will have groundwater appropriation rights filed with the SEO on behalf of the CBM operator and surface landowner." If the operator will be applying for appropriation rights, what is the beneficial use that the operator is claiming?

5. Protection of Wetlands:
What steps are being taken to maintain compliance with EO 11990 (Protection of Wetlands) in view of the numerous potential impacts to wetlands cited throughout the EIS? Wetlands are discussed on page 4-85. It is good that surface disturbance is prohibited within 500 feet of surface water, but any mitigation plans should be included in or appended to this EIS for public review and comment (as previously noted). On page 4-86, in the third full paragraph, the EIS indicates that landowners will have the opportunity to bank newly created or expanded wetlands from CBM discharges, which may also be used as temporary mitigation in the event a landowner requires a wetland credit. It seems unlikely that newly flooded or expanded areas satisfy the statutory definition of a wetland, which includes wetland vegetation, because these newly flooded areas will have no vegetation. In addition, if a wetland expands due to flooding, this could mean that existing wetland vegetation becomes non-viable due to flooding and may trigger EO 11990. This should be addressed as a potential impact with related mitigation alternatives, such as reduced discharges or modified discharge points.

6. Submission of Water Management Plans to BLM for approval:
The EIS reflects that Water Management Plans must be submitted to the BLM as elements of "Standard 'Conditions of Approval' in appendix B of the EIS. Since these water management plans will detail potential impacts of the Proposed Action and will set forth mitigation alternatives, they should be included in or appended to this EIS so that they are subject to public review and comment as required pursuant to NEPA (as previously noted).

7. Public review and comment of "Standard 'Conditions of Approval' for APDS (Appendix B):
Throughout the EIS, impact analyses and mitigation alternatives are absent or deferred for review in the APDs and Sundry Notice Plans. The "Standard 'Conditions of Approval' for APDs" set forth general requirements for the mitigation of various potential impacts, such as mitigation for the impacts of water discharges. Consequently, the impacts identified in the Standard Conditions for Approval for APDS, along with associated mitigation provisions, or "conditions", should be included in, or appended to, this EIS so that they are subject to public review and comment a required pursuant to NEPA.

8. Land should be restored by CBM producers:

The first sentence in the third full paragraph on page 2-11 should be restated as follows: At the conclusion of the project, roads, culverts, cattleguards, pipelines, stock watering facilities, or other structures will be removed unless left in place pursuant to agreement of the surface owner. Likewise, under the heading of "Electrical Distribution Lines" in the next paragraph, the second to last sentence should indicate that power lines will be removed unless the surface owner agrees that they should remain in place. The EIS should reflect that CBM producers will seek to restore the land to its original condition unless there is an agreement with the landowner to leave the land in an altered condition.

9. Monitoring should include provisions developed through the EIS process:
On page 2-13, hydrologic monitoring plans should also address any additional regulatory requirements, including requirements identified through the EIS process.

10. Water Well Agreements:
It is good that water well agreements are being required to be offered to affected surface owners (page 2-16). However, the Water Well Agreement provides that it applies only to permitted water wells. What mitigation is available to water users that are accessing water from a source other than permitted wells? Of notable absence in the Water Well Agreement (Appendix D) is a provision regarding the length of time that the Agreement remains in effect. The agreement should provide that landowners should be compensated under the Agreement for water drawdowns that adversely impact their wells for as long as the condition continues.

11. Further explanation regarding Alternatives Considered But Not Analyzed in Detail (page 2-28):
The alternative for injecting produced water underground is dismissed because injection "into an exempt formation would make water now suitable for irrigation and livestock unusable for any future use." Why would injection be limited to an "exempt formation," and what is an exempt formation? Could water be injected at some other point with potentially positive effects on aquifers or groundwater? This alternative needs to be explained in further detail and possibly requires further analysis. Also, could water be transported to recharge areas for discharge with positive effects? Would moderating rates of discharge potentially improve recharge capabilities?

12. Fire mitigation:
On page 4-18a the EIS indicates that range fires and spontaneous combustion have ignited areas of exposed coal. What mitigation alternatives are available should this event occur? What compensation may be available to landowners for lost land productivity due to fires? What compensation or mitigation is

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available to landowners that experience methane or other chemical contamination of their property resulting from CBM production?

13. Water Quantity mitigation:
The section on "Water Quantity" beginning on page 4-11 indicates that drawdown in some areas could potentially be severe in some areas, and may continue for long periods of time. What long term mitigation alternatives are available to landowners for prolonged, severe water drawdown? No term is specified in the Water Well Agreement, nor is mitigation for landowners accessing water sources other than permitted wells.

14. Soil and vegetation reclamation:
Soil impacts are discussed beginning on page 4-79. In all cases soil reclamation and revegetation should occur using native vegetation whenever feasible, and the reclamation of surrounding native plant communities should be stated goal of reclamation and revegetation. With regard to Ucross soil, will alternatives to standard reclamation be feasible? What are the alternatives and mitigation options? On page 4-82, the EIS provides that most short-term disturbance areas will be revegetated within one to three years. Can language be added here that indicates that revegetation will occur as soon as possible after activity in an area is completed, in order to prevent erosion and to insure weed control? It is good that proposed mitigation, on pages 4-83, includes avoidance of disturbance within areas with soils that would be difficult to revegetate. In the Cumulative Impacts section of the EIS addressing reclamation, impacts are listed on page 4-135 which suggest that reclamation mitigation should include placement of some native shrub and tree species in areas frequented by wildlife.

15. Fish:
Page 4-91 indicates that mitigation for unspecified potentially adverse impacts may be included in site-specific conditions of approval for APDs. As stated in previous comments, examination of impacts and possible mitigation alternatives should be discussed in this EIS, not in some future document that is not subject to public review and comment pursuant to the requirements of NEPA. One potential impact to fish would be TDS levels that could impact reproduction. Mitigation alternatives for this and other potentially adverse impacts should be examined in this EIS.

16. Bald Eagle:
On page 4-92, the EIS provides that access to roost sites can be carefully controlled or avoided during the winter. The word "can" in this sentence should be changed to "will."

17. Noise:
On page 4-114, the EIS provides that noise levels around a compressor would be below 55dBA (the level at which noise is judged to affect public welfare) at an estimated 600 feet from

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the compressor sites. However, the welfare of members of the public who view and hunt wildlife would be affected if noise adversely affects wildlife at a distance closer than 600 feet (and higher than 55dBA), so potential mitigation for noise levels beyond 55dBA in certain wildlife areas should be discussed in the EIS.

18. Cumulative Impacts:
Numerous potential surface water impacts to land areas are mentioned on page 4-133. However, no mitigation alternatives are discussed, and these should be included in this EIS. Likewise, what are the mitigation options and alternatives for the reduced or irregular flows that may develop in regard to springs?

Very Truly Yours

Willis Geer
PRBRC Chair

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July 14, 1999

Bureau of Land Management
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Attn: Richard Zander

Gentlemen:

Prima Oil & Gas Company would like to offer the following comments of the Draft Environmental Impact Statement (DEIS) for the Wyodak Coal Bed Methane Project. First, however, Prima would like to express appreciation for the hard work that the staff of the Buffalo Field Office of the BLM has put in on this project. What follows are some specific comments on the document which are not necessarily in any particular order.

From Appendix B, the last bullet point on page B-2, under Permanent Water Management Plan, the statement is made in the third sentence "Cumulative discharge must not exceed the naturally occurring storm annual peak flow of the receiving channel."

Likewise, on page 4-14, the second bullet from the bottom of the page, "Discharges will be limited to a volume less than or equal to the naturally occurring storm annual peak flow that can be handled by the channel cross section under anticipated conditions, including flood events such as the 2 year 24 hour storm."

Comment: Most of the drainages in the study are essentially dry. This could be interpreted as prohibiting the discharge of water into such drainages. This wording should be eliminated from the final draft as not being reasonable.

In Exhibit B, page B-3, the last bullet on the page under the heading Permanent Water Management Plan contains a requirement to do a hydrological watershed analysis including quite a number of specific points.

Comment: First the term watershed as used in the proposed "Conditions of Approval" is not defined and is too general. Such a condition could lead to abuse of the process. In fact, the requirement creates a very burdensome and expensive situation, and is unprecedented in our experience. The BLM itself is in a better position to do studies of larger areas cutting across lease and jurisdictional boundaries and should assume this responsibility.

On page 4-14. "Existing downstream culverts may need to be replaced with larger sizes......

Comment: This "Mitigating Measure" is too vague and open-ended. While the idea appears to be reasonable, the practical aspects are not. For example, what if the downstream owners do not wish their culverts replaced? Under what authority would such a thing be done? Also, how far down stream would this be analyzed? Theoretically, this could result in responsibility miles away from the point where the water was generated. We believe that this should be limited to the leasehold of the Operator.

Also on page 4-14, the second bullet "Produced water may be transported to distant discharge points..."

Comment: Again this is too open-ended. It assumes that the surface ownership situation is either consistent or at least the surface owners are in agreement as to the transportation of this water. If this is left in the DEIS as a potential Mitigating Measure it should be clarified that it would be applied only in cases where all affected parties have agreed or where the pipeline would be limited solely to the surface where the discharged water originated. Furthermore, it should be the at the option of the Operator. Otherwise a situation could be created that would be impossible to comply with.

Again on page 4-14 under the bullet beginning "Alternate discharge points will be utilized..."

Comment: The WDEQ already requires that all discharge points be permitted under the NPDES process. Requiring that additional discharge points be permitted to handle periodic or seasonal water flows is neither practical or reasonable. This potential Mitigating Measure should be either reworded or eliminated.

On page 4-14, bullet number 7 suggests that "River Monitoring" will be conducted.

Comment: It is not specified who will conduct or pay for such monitoring. We would suggest that once again such an open-ended statement is an invitation to misunderstanding at the very least. No such monitoring should be the responsibility of the Operators. Operators are already being asked to conduct a variety of tests and monitoring procedures. Such additional requirements are unreasonable. In addition, since it is likely that a variety of Operators may discharge water that ultimately may find its way in to such rivers, it isn't feasible to decide who should conduct or who should bear the expense of such monitoring. It should be made clear that such monitoring will be conducted by either the State of Wyoming or by the BLM.

7. On page 2-18 the paragraph beginning "The following monitoring would be conducted by the BLM..." calls for costs to potentially be borne by the operators through "cost reimbursement".

Comment: The document should clarify exactly how this would work and what is the expected cost range. Excessive costs would have a detrimental effect on the expected economic return to the Operator and could cause the abandonment of the project. This would in turn result in large losses both on the part of the Operators as well as the general public in the form of lost revenues from royalties and taxes.

On page 20-2, the paragraph starting "Where suitable wells do not exist..."

Comment: This requirement to drill "Additional Monitoring Wells" is both burdensome and unreasonable. In addition, it is arbitrary and subject to abuse. The very character of this project is to drill large numbers of wells. To require the drilling of additional wells, especially on lands not necessarily under the control of the operator is inviting trouble while compounding the surface disturbing activities for very little if any additional benefit. We believe that this entire concept and provision should be completely eliminated from the DEIS.

Again we would like to express our appreciation for the hard work that has gone into the preparation of this document.

Sincerely,
PRIMA OIL & GAS COMPANY

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G. Walter Lansford
Vice President, Land

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PETROLEUM ASSOCIATION OF WYOMING

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July 13, 1999

BUREAU OF LAND MANAGEMENT
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BUFFALO FIELD OFFICE
BUFFALO WY

Mr. Richard Zander
United States Department of the Interior
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Dear ~~Mr. Zander~~ Richard

The Petroleum Association of Wyoming (PAW) whose membership accounts for the majority of oil and gas exploration and production occurring in Wyoming appreciates the opportunity to comment on the Wyodak Coal Bed Methane Draft Environmental Impact Statement (Draft EIS). Throughout the study area, numerous PAW members are active participants in the development of the Coal Bed Methane (CBM) resource. Though PAW has interest in the entire document our comments today are limited to the following:

PAW addresses Appendix B and D first due to a key concern regarding expansion of BLM authority on to non-federal lands to address water management issues. BLM's does not have the jurisdiction to mitigate impacts to non-federal lands caused by development of federal oil and gas leases. Nevertheless, PAW recognizes the need to address reasonable and fair off-site water management issues directly related to CBM development and we also encourage our members to do so.

Appendix B – "Standard Conditions of Approval" for APDS

In Section 1 of Appendix B, operators are required to provide BLM with a comprehensive *water management plan* for all lands affected by a project regardless of ownership. Approval of an APD is subject to approval of the *plan* and the *plan* requires submission of specific performance standards to be applied to non-federal lands, such as: use of energy dissipation measures, structure design criteria, monitoring requirements, oversight of remedial work, etc. What is BLM's legal authority to encumber operators with requirements such as these on non-federal lands? PAW is not aware of any specific authority and is of the opinion the lack of authority may result in subsequent challenge.

Appendix D – Water Well Agreement

Application of Appendix D creates a jurisdictional issue comparable to BLM's proposed application of water management plans. PAW believes that requiring an agreement on non-jurisdictional lands (i.e. non-federal) also exceeds BLM's authority. If BLM elects to require submission of water well agreements for wells on non-federal lands, please indicate in the final EIS the legal authority to do so.

Hydrologic Monitoring and Mitigation

Page 2-16, fourth paragraph: A maximum limit on the circle of influence (COI) should be one mile. Extending to the next nearest well may require moving out several miles that would certainly be well beyond the circle of influence of a CBM well. Also, it should be stated that if a water well is already covered by a water well agreement from another operator, a second agreement is not necessary as long as the operator closest to the water well has the agreement.

Page 2-17, third paragraph: The reason for GAGMO is that the coal mines do not have water well agreements and the DEQ/LQD Mine Permit requires control of the water levels in an aquifer. CBM is trying to draw down the water in the coal seam just far enough to release the gas. The aquifer will not necessarily be depleted. CBM operators do have water well agreements and thus what is the purpose of PRAGMO? Any well affected by CBM activity will be covered by a water well agreement. PAW asks this question to avoid burdensome reporting of unnecessary data.

Page 2-17, last bullet on the page: It is not possible to get a static water level in areas where wells around the monitor well are pumping. Please recognize that the monitored level would be a working level.

Environmental Consequences

SURFACE WATER

Page 4-14, fourth bullet: Alternate discharge points on non-federal lands are a matter between the surface owner and the lessee. Both the Wyoming Department of Environmental Quality NPDES discharge permit and the BLM water management plan (see comments under *Appendix D* above) address prevention of flooding and erosion. Additionally, NPDES permits are for one specific point of discharge. WDEQ does not allow multiple/optional discharge points in permits. In order to change a discharge point, operators would be required to seek approval for permit modifications. BLM should consult with the WDEQ regarding the possibility of *multiple/optional* discharge points being contained in a single permit.

Page 4-14 sixth bullet: PAW recommends the following rewording: "operators should observe existing downstream culverts on lease and determine if the need to be replaced with larger sizes to handle total flows. Off lease, it is recommended that the operator attempt to work with other operators and with the surface owners in the same drainage to replace existing undersized culverts in the area downstream that would be affect by their discharge." Our proposed language clarifies that BLM does not have authority on non-federal lands yet it reminds operators of their responsibility to address downstream concerns where reasonable and fair.

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Page 4-14, seventh bullet: PAW is unaware of any authority granted BLM to restrict discharge volumes. This bulleted item arguably could result in denial of rights to develop leases in order to limit the flow of the cumulative discharges. Federal oil and gas leases grant lessees the right to explore, develop and produce oil and gas absent any lease stipulation restricting that right. Limiting volumes of discharge would preclude many leases from being developed. Denial to discharge would definitely eliminate CBM development. Will BLM deny discharges from federal lands because discharges in the same drainage from non-federal lands exceed the mean annual flow for a 2-year 24-hour event?

Page 4-16, fourth bullet: This item again implies the BLM has authority on non-federal lands. BLM authority is limited to the discharge method and point on lease. PAW recommends the statement be reworded as follows to address this concern: "The operators and landowner or lessee may consider irrigation diversions to increase channel length and in-stream impoundments, as appropriate, as measures to address issues of erosion or flooding."

Page 4-18, seventh bullet: PAW recommends that the last statement of the paragraph be omitted. Neither the BLM nor the USGS have authority for river water quality. BLM can ask that they be notified of plans on federal lands.

Page 4-38 Second to last sentence at the bottom of the page: "For individually impacted water wells, see the "Mitigation Measures" section." PAW cannot find this section relative to groundwater. The only Mitigation Measure section PAW could find relates to surface water.

Sincerely,

Tom

Thomas H. Clayson
Vice President

cc: Parsons
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July 12, 1999

BUREAU OF LAND MANAGEMENT
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BUFFALO FIELD OFFICE
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Mr. Richard Zander
Bureau of Land Management
U.S. Department of the Interior
Buffalo Field Office
1425 Fort Street
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Re: Comments on the Wyodak Coal Bed Methane Project Draft EIS

Dear Mr. Zander:

I. Introduction

Kennecott Energy Company ("KEC") provides management services to Colowyo Coal Co. in Colorado, Antelope Coal Co., Caballo Rojo Inc., Cordero Mining Co., Jacobs Ranch Coal Co., Kennecott Uranium Co., and Wyoming Coal Resources Co. in Wyoming, and Spring Creek Coal Co. in Montana. On behalf of operations in the vicinity of the Wyodak Coal Bed Methane ("CBM") Project, KEC submits the following comments on the draft EIS for that project. KEC supports the development of diversified energy sources in Wyoming, and encourages the continuation of the Environmental Impact Statement ("EIS") process for this project, contingent upon the BLM affirmatively addressing the concerns outlined below.

KEC does not wish to hinder development of CBM in the project area, but CBM development cannot be allowed to proceed in a relatively unrestricted manner, which will impede coal development in the Powder River Basin. The draft EIS does not assess the severe adverse economic and social impacts that would result from relatively unrestricted CBM development. In addition, CBM development cannot proceed based upon poorly modeled information in the EIS relative to coal related impacts. The treatment for coal mining and coal transportation in the air and water modeling efforts contain several flaws, problematic assumptions, and highly questionable approaches that result in unreliable results. As such, the cumulative results and inferences related to these activities cannot be accepted. These issues are discussed in the detailed comments below.

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II. Coal/CBM Conflict Issues

The draft EIS document superficially mentions potential conflicts between energy development interests, but does not address fully these conflict issues or disclose the serious economic harm to Powder River Basin coal development which is posed by relatively unrestricted CBM development. Under the applicable regulations of the Council on Environmental Quality ("CEQ"), which implement the National Environmental Policy Act ("NEPA"), 42 U.S.C. § 4332, when an EIS "is prepared and economic or social and natural or physical environmental effects are interrelated, then the . . . [EIS] will discuss all of these effects on the human environment." 40 C.F.R. § 1508.14. See also 40 C.F.R. § 1508.8(b) ("Effects includes ecological . . . , aesthetic, historic, cultural, economic, social, or health, whether direct, indirect or cumulative.") (Emphasis added). The sole discussion of CBM/coal development conflicts in the EIS consists of the following statement at page 4-2:

> Conflicts between CBM drilling and existing or potential surface coal mining may occur. Development of CBM wells should be precluded in areas of active or impending coal mining. Locating wells in areas where future mining may take place would preclude mining during the life of wells located in the proposed mining area. Coal in these areas could be mined after CBM extraction is completed or terminated, or after an agreement is negotiated between the CBM operators and the coal mine operators.
>
> Development of existing mineral rights in the project area would be based on existing claims, lease terms and agreements; future conflicts would be dealt with on a case-by-case basis.

The draft EIS does not specify how broadly or how narrowly an area of "impending coal mining" will be delineated by BLM to protect future mining from CBM development impediments. The draft EIS appears to support a policy that would presumptively place areas where CBM development is occurring off-limits to coal mining until CBM extraction is complete. By stating that CBM/coal development conflicts will be "negotiated" on a "case-by-case" basis, the BLM appears willing to subject coal operators to economic "take-it-or-leave-it" demands by CBM operators that are unrelated to the true value of the affected CBM. Coal mining is a highly competitive business. If the cost to mine Powder River coal is raised significantly by exorbitant "compensation" demands from CBM operators, coal operators will be forced to reduce their level of coal mining or stop mining altogether.

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The draft EIS does not undertake a proper social and economic impact analysis as required by NEPA. There should be no doubt that relatively unrestricted CBM development has the potential to greatly impede or block continued coal development in the Powder River Basin. Proposed CBM development is based on an assumed 40-acre well spacing pattern, which is far denser than conventional oil and gas well spacing. See DEIS at 3-1. The proposed action involves an estimated 3,000 new CBM wells. Id. Each well has an estimated life of 12 years, but the well life could be longer. Id. at 3-2.

If BLM makes a policy decision to prohibit surface coal mining from proceeding in areas where CBM production may be occurring, there would be enormous disruption to the socio-economic base of the region. Annual production of Powder River Basin coal is projected to generate about $2.3 billion, supporting nearly 10,000 full-time jobs. DEIS at 4-117. By contrast, CBM development in the Powder River Basin is expected to require a long-term workforce of 280 employees. DEIS at 4-118. The draft EIS acknowledges these facts, but does not recognize that the extensive economic and social benefits of coal mining are jeopardized by CBM development unless BLM takes affirmative steps to ensure that such development occurs in an orderly and coordinated manner. The draft EIS identifies (DEIS at 4-119) the $93 million in federal royalties projected to be generated over the entire 20-year life of the CBM development project, but it fails to note that annual federal coal royalties far in excess of that figure are threatened by relatively unrestricted CBM development. Indeed, federal coal royalties from the Powder River Basin – which now exceed $160 million annually – are not even mentioned in the draft EIS.

Based upon the broad geographic scope of this EIS and the projected CBM development, BLM's actions could impede continuation of existing surface coal mine operations within the Powder River Basin, until such time as the CBM has been extracted. Before carrying out this proposed action, BLM must assess the requisite social and economic impacts, and take into consideration the relative economic impacts to federal, state and local economies of the financial gains realized from both surface coal mining and CBM extraction. Further, because of the importance of Powder River Coal to the Nation, BLM's actions here will have far-reaching impacts which this EIS must assess. As the draft EIS notes, the Powder River Basin "contains some of the largest accumulations of low sulfur sub-bituminous coal in the world . . . ", and this "coal is valued for its clean-burning properties." DEIS at 3-4. BLM has a responsibility to protect this enormously valuable coal resource which is important to the Nation from relatively unrestricted CBM development.

The draft EIS does not consider reasonable alternatives to relatively unrestricted CBM development. The alternatives analysis is the heart of an EIS. 40 C.F.R. § 1502.14. This section should "rigorously explore and objectively evaluate all reasonable alternatives . . . ." 40 C.F.R. § 1502.14(a). One obvious alternative not discussed in this draft EIS would be to allow CBM development only subject to a "Multiple Mineral Development Plan" which would delineate the procedures and conditions to minimize CBM/coal development conflicts. This Multiple Mineral Development Plan would become a part of the BLM approval of the Application for a Permit to Drill ("APD") for each CBM well. In the draft EIS, BLM proposes a "water management plan" (DEIS, App. B), and recognizes the need for conditions on CBM development to protect virtually every resource (except coal), e.g., endangered species, cultural resources, and paleontological resources. See DEIS at 1-13, and App. B.

BLM's failure to fully address the serious issues raised by CBM development and the conflicts with coal development is particularly inexcusable where the EIS scoping process framed the critical issue: "will CBM development impede future recovery of the coal?" See Wyodak EIS, App. C, Scoping Summary, dated Mar. 10, 1998 at 2. The BLM's scoping document also stated: "Conflicts occur between the CBM operations and the coal operators in development of their respective resources." Id. The whole purpose of scoping is to identify the key issues to be addressed in detail in the EIS. The draft EIS does not address this critical question raised early in the EIS scoping process. This defect renders the draft EIS fundamentally flawed.

BLM should develop comprehensive guidelines that require CBM development pursuant to an approved "Multiple Mineral Development Plan," and which recognize:

(1) the relative annual economic values (including jobs and royalties) in the production of coal and the production of CBM;

(2) the relative values of the investments heretofore made and hereafter to be made by the coal mining operators and the CBM operators;

(3) BLM's statutory and regulatory obligation regarding multiple mineral development (see, e.g., 43 C.F.R. § 3000.7 (the "granting of a permit or lease for the prospecting, development or production of deposits of any one mineral shall not preclude the issuance of other permits or leases for the same lands for deposits of other minerals with suitable stipulations for simultaneous operation . . . ."); and

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(4) the common law "Accommodation Doctrine" by which one mineral developer may reasonably and concurrently impact other mineral developments (see recent U.S. Supreme Court decision in Amoco Prod. Co. v. Southern Ute Indian Tribe, ___ U.S. ___, 1999 WL 380881 (1999), and Letter from [illegible], Esquire, of Kennecott Energy to Peter Schaumberg, Esquire, Office of the Solicitor, U.S. Department of the Interior, dated July 1, 1999 (copy enclosed)).

II. Environmental Impacts From Coal Development Are Grossly Exaggerated in the EIS.

Since this is an EIS for proposed CBM actions, the reduced attention to accuracy and detail for impacts from coal mining and transportation activities is somewhat understandable. However, the exaggerated projections of coal-related impacts cannot be accepted. These results are included in the draft EIS as equivalent to those derived from the much more refined treatment of CBM impacts. It is incumbent upon BLM to ensure that the published results in the EIS do not provide a basis for misinformation or misinterpretation in the future. Projected coal related impacts must be amended with equivalent refinement and accuracy, or these projections must be eliminated or qualified heavily.

To address the parallel needs for expediency in processing this EIS and ensuring accuracy in published results, the BLM must, at a minimum, revise the Introduction and Cumulative Impact sections of the EIS to:

(1) Clarify that the modeling projections of potential air quality impacts from future coal development are inconsistent with the observed effects of two decades of expanding coal mining activities;

(2) Clarify the differential modeling treatments between CBM and coal mining and transportation.

(3) Acknowledge the significant issues raised by the coal industry regarding assumptions used and modeling results for projected coal related impacts.

(4) Clearly state that the coal related results of air modeling are only preliminary, that the results remain under review and should not be referenced or interpreted until future resolution through the next coal related EA or EIS action.

(5) Revise the groundwater modeling discussions and results through remodeling efforts addressing the substantial insufficiencies and flaws identified by the Gillette Area Groundwater Monitoring Organization.

(6) Separately address the direct and attributable impacts for the proposed CBM activities.

This approach should allow the EIS process to continue, while also allowing resolution of the coal related issues raised by the document. If BLM cannot meet these requests, then KEC requests a 60-day extension to the comment period to allow for the comprehensive review necessary to ascertain the validity of several of the modeling assumptions and to determine the accuracy of the modeling results. The comment period allowed for this document is inadequate to address the numerous flaws in the coal-related considerations of air and water issues.

A. Air Quality Issues

Modeling procedures for non-CBM emissions raise several significant concerns:

a. The Far-Range modeling results conflict with extensive existing data. As such, the modeling results appear highly speculative and inappropriate for an EIS document. For example, in the characterization of the existing environment, the draft EIS states correctly that "[v]isibility of more than 60 miles is common in the project area and has been documented . . . . Significant reductions in visibility are related to weather conditions associated with high relative humidity, such as fog, haze, rain, and snow." DEIS at 3-23. In addition, based on actual extensive monitoring data, the annual average values for PM_{10} are 34% of the applicable annual standard, i.e., more than 60% below the stringent standard. Id. Further, the average annual NO_2 levels are more than 80% below the standard. Id. These extensive and existing data demonstrate that there are no significant adverse impacts to local and regional air quality, notwithstanding the dramatic increase in Wyoming coal production of more than 300%, from 94 million tons in 1980 to 314.5 million tons in 1998. See DEIS at 4-137 (90% of this production comes from the project area). The DEIS projects future Powder River Basin coal production to increase by a relatively modest increment of about 20% over the next 15 years to 380.7 million tons. See DEIS at 4-115. Yet, the draft EIS sets

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forth improbable modeling results indicating that significant adverse impacts to regional haze are expected by 2015 from NO$_x$ and PM$_{10}$ emissions from coal mining; indeed, these projected air impacts will purportedly cause visibility to be reduced in Class I National Park areas by more than 5% for 110 to 135 days per year. DEIS at 4-148. Publication of such speculative projections does a disservice to Powder River Basin coal operators, BLM, and the public.

b. Coal train emissions comprise 84% of modeled Far-Range NOx emissions, the largest delineated emission source (Table 4-17). Preliminary review of the modeling indicates that train emissions were not modeled realistically, as continuous low-level emissions, but instead in a highly artificial manner as cumulative fixed sources at intervals along the track line. This treatment produces exaggerated emissions at those fixed locations, producing unrealistically high readings at any nearby receptors.

c. Coal locomotive fuel usage rates applied to the Near-Range and Far-Range models appear to be unrealistically high, approximately 23 gallons of diesel per rail mile, rather than the 8 to 9 gallons suggested by the supporting documentation in the draft EIS. Corresponding emission rates are thereby significantly exaggerated, exacerbating the overpredictive modeling effects.

d. Modeled locomotive emissions fail to account for industry and regulatory predictions of decreased locomotive emissions in the near future. The draft EIS acknowledges (at 4-149) that modeling did not account for the 40% decrease in locomotive NOx mandated by EPA to occur by 2007, a point approximately at the mid-point of the modeled period. Ignoring these mandated reductions biases the modeling results of Tables 4-17 and 4-18, and all associated conclusions, toward inflated estimates of locomotive emissions and impacts. This is a substantial flaw in the strategic assumptions and modeling processes used in the draft EIS.

e. There is no evidence that the Far Range modeling results were calibrated using existing data. As such, the results can only be considered as imprecisely estimated trends, not the absolute figures reported in the EIS document.

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f. The cumulative analysis for visibility impacts from NO$_x$, SO$_2$ and PM$_{10}$, as described (at 4-140 to 4-152), focuses only upon emissions estimated for CBM activities and coal mining related activities. The only mobile sources considered are road dust from CBM vehicle traffic, mining vehicle exhaust and coal train locomotive emissions.

The modeling exercise does not account for impacts from exhaust emissions from CBM vehicles, and for exhaust emissions from general public vehicles. This latter source particularly needs to be considered relative to the claimed visibility impacts at the Class I and Class II areas in the analysis. Strong vehicle use rates at several of these sites (e.g., Badlands National Park, Mount Rushmore National Monument, Devil's Tower National Monument, etc.) during the higher NOx-ozone seasons must be considered in any impact analysis.

Similarly, the exhaust from traffic patterns along Interstate 90 in the near proximity of several of the Class I and Class II areas in the analysis (e.g., Badlands National Park, Devil's Tower National Monument, Cloud Peak Wilderness, etc.) must be considered in any impact analysis. This analysis does not consider any of these points.

g. The analysis does not consider any impact on visibility from prescribed burns initiated by federal land managers at or near the Class I and Class II areas in the analysis.

B. Water Issues

The Groundwater section of the draft EIS indicates that an "assessment of groundwater impacts for Lighthouse CBM development in the eastern PRB was performed . . . but the results have not yet been published. Information from this work was used in the compilation of this EIS where appropriate." (DEIS at 4-135 and 4-136.) The Lighthouse project was approved 4 years ago; why is the groundwater impact assessment still unavailable? Use of this unpublished information, vague references to use of some of this information in the current draft EIS analysis, and failure to include the specific information from that study in this groundwater analysis is unacceptable. Such an approach denies any reviewer the ability to verify the assumptions and/or results of the contractor analyses and frustrates the purpose of NEPA.

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The draft EIS (at 4-1 and 4-2) states as follows:

> CBM development occurring upstream from nearby surface coal mines could affect coal mining operations. CBM generated water discharged upstream from coal mines could increase surface flows in the vicinity of coal operations or decrease the rate of groundwater withdrawals that currently accompany ongoing coal mining operations. There likely will be impacts to sediment structures in the coal mine permit areas. These structures have been designed to accommodate historical flow rates that do not include contributions from CBM generated flows. Some design aspects of mining operations may need to be changed. Any required revisions to approved mine plans would impact operators and agencies involved in reviewing proposed changes.

This discussion implies several disturbing and unrealistic assumptions. First, that coal mine operation sediment control ponds will accept CBM discharge runoff. Second, that coal mine operations will change some structural designs to accommodate CBM discharges. Third, that coal mine operators and related regulatory agencies will conduct coal permit changes to accommodate CBM activities and discharges. These assumptions raise clear questions of trespass, offsite damages and illegally imposed burdens to coal operations. BLM must revise this section by removing these assumptions or by adding clear directions that CBM operators must obtain appropriate landowner consent prior to any discharge, and bear all associated expenses, to address any and all of these projected impacts.

KEC has reviewed comments prepared by the Gillette Area Groundwater Monitoring Organization regarding the draft EIS and concurs with their findings that the EIS groundwater model must be rejected and a new model constructed to address several deficiencies:

a. Inadequate calibration and inaccurate results.

- Only 44 wells used to verify model results over 20,000 square miles.
- The model does not address differences of nearly 300 feet in the predicted and actual hydraulic head data at these wells.
- Model results are accepted that predict drawdown depths substantially in excess of the actual saturated thickness.
- The model does not address significant inconsistencies with long-term approved drawdown modeling by coal mines in the project area.

b. Inaccurate modeling parameters.

- The model characterizes the project area overburden as a single homogenous fine-grained sand unit. This is contrary to the actual heterogeneous condition that is thoroughly described in existing coal mine baseline information for areas within the project area.
- The model unrealistically assumes an impermeable clay layer exists between overburden and coal throughout the project area.
- The model does not apply considerations of existing faults, cleats and other known structural characteristics of the coal bed in the project area. These features have a significant impact on predictions of drawdown and flow.
- The results of the model over-predict coal mining impacts on overburden drawdowns and under-predict similar impacts from CBM activities.

IV. Conclusion

Each of the above points is sufficiently compelling to require substantial modification of the results and discussions in the draft EIS document. Our recommendations should allow BLM to address these issues while expeditiously continuing the process for the proposed CBM actions.

KEC appreciates the opportunity to comment on this draft EIS. Please contact me at the letterhead address (or at 307-687-6091) if further details are needed on any aspect of these comments.

Sincerely,

Bob Green

Bob Green
Environmental Manager

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July 13, 1999

Triton Coal Company

Buckskin Mine
P.O. Box 3027
[illegible]

BUREAU OF LAND MANAGEMENT
JUL 14 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Bureau of Land Management
Buffalo Field Office
Richard Zander
1425 Fort Street
Buffalo, WY 82834

RE: Draft EIS Wyodak Coal Bed Methane Project Comments

Dear Mr. Zander:

Thank you for the opportunity to comment on the CBM EIS. Triton Coal Company owns and operates two coal mines and additional grazing lands within the bounds of this project area. We are concerned that there may be some environmental impacts that are not adequately addressed in the draft document. We are also concerned that modeled impacts (specifically air quality and water) have not been modeled correctly. We are not opposed to CBM per se, we have a very good relationship with the CBM operator in our area (Redstone Resources) and hope to continue with the agreements that have allowed us both to operate. However, we are concerned the analysis (or lack thereof) presented in this EIS may jeopardize the future of our mine.

Specific comments/questions follow.

Page 1-2: The predictions continually repeated through out Gillette speculate in excess of 12,000 productive CBM wells being developed in the next 10 years. Those of us living in Gillette have seen first hand the level of interest and the rapid development of CBM interest. Companies are actively pursuing CBM in the northern Powder River Basin near Sheridan and up into Montana. Exploratory drilling is occurring near Buffalo and Lake DeSmet. Companies are actively exploring various deep coal seams other than the Wyodak (the [illegible] and [illegible] near Buckskin). Perhaps the industry projected number of 3,000 to 5,000 new productive wells, and the project area, was realistic two years ago when this project started, but it now appears low.

We believe that it is in everyone's best interest that this EIS adequately address and evaluate the cumulative impact of all past, present, and reasonably foreseeable future environmental impacts. The BLM has failed to do this in the numerous previous CBM EA's and EIS's. The BLM has received comments in the past that these documents were not accurately predicting reasonably foreseeable future CBM development.

Does the BLM anticipate preparing another CBM NEPA document for the Powder River Basin in the near future? If so, would this be a related action? Is it reasonably foreseeable?

Conflicts are occurring between CBM development, coal development, and surface management. A piecemeal approach may not be the correct way to address these issues.

Page 1-1: With the exception of the Geology section, the EIS continually lumps "oil and gas rights" into the generic term "mineral rights". This is a critical issue which will no doubt be receiving some additional consideration. Could you please use the exact mineral right which applies through out the text.

Page 1-2: The BLM has expressed the need to reduce the possibility of CBM drainage from the federal estate. Does the BLM have authority under existing oil and gas lease terms to require an oil and gas lease holder to drill and develop the lease if the agency finds that drainage is occurring (Section 4 of Standard Lease Terms)? If so, has the BLM ever made such a request to a CBM operator? If not, why?

Triton Coal Company has a federal coal lease. We have federally mandated diligence requirements to actively mine and sell this coal. The BLM has chosen to lease two competing leases over the same surface. Triton Coal Company and Redstone Resources (CBM operator) have successfully cooperated in the vicinity of the Buckskin Mine to minimize impacts to either operation. We have absolutely no problems with a CBM operator actively developing their oil and gas rights. However, an emphasis must be placed on "actively developing". We would like to see an analysis of the impacts of increasing the well spacing pattern to 20 acres in the vicinity of active coal mines. We understand that the WOGCC has jurisdiction in setting the spacing. However, BLM is mandated to analyze reasonable alternatives even outside their jurisdiction to minimize impacts. Would a 20 acre or even 10 acre spacing expedite the recovery of CBM, thereby reducing coal-CBM conflicts and likewise prevent drainage?

Rumors hold that there are some oil and gas operators attempting to "hold hostage" or "blackmail" coal companies into buying out their federal oil and gas rights or simply compensating them to allow mining to continue. Does the BLM have any knowledge of this occurring? If so, what is the BLM doing about it? Likewise, there needs to be a detailed discussion in this EIS that addresses just this issue. Triton Coal Company raised this issue during scoping. Just how does the BLM plan to address competing mineral rights? The often repeated "first in time – first in right" saying needs clarification. If a federal coal lease holder is executing their valid right to mine coal and a federal oil and gas lease holder is not executing their valid right to recover gas, who is first in time? Again, coal leases come with diligent development requirements, oil and gas leases do not. However, standard oil and gas lease terms do mandate that "operations must be conducted in a manner that minimizes adverse impacts to …elements of the environment, as well as other land uses or users."[emphasis mine]. We believe this EIS is an appropriate place to begin this analysis. Can you place new oil and gas lease stipulations on existing oil and gas leases as a result of significant environmental impacts assessed in this document? Is the BLM now placing special or supplemental stipulations on new oil and gas leases to address this identified conflict? If not, why not? The Record of Decision for the Buffalo Resource Management Plan (page 15) MM-4 states that oil and gas drilling and production will be deferred on active coal leases. Does the BLM still stand by this decision? Also MM-5 in the RMP addresses new coal leases in identified Known Geologic Structures (KGS's), CBM development was not predicted or analyzed in the RMP (or the TBNG Oil and Gas Leasing EIS or the Medicine Bow National Forest Forest Plan [for that matter]), therefore can we assume that the CBM play is not a KGS? Likewise, given the extensive previous analysis and predictions of future coal development – just who is "first in time"? We have also heard a rumor that the BLM is delaying processing of Coal LBA's until this CBM EIS is finalized. If this is the case, is this consistent with the ROD for the RMP?

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Page 1-2: We can agree that the "proposed action" analyzed in this EIS is adequately covered by the "project boundary" but, as stated above there are reasonably foreseeable future CBM projects in several other areas under the jurisdiction of the BLM and the Buffalo Field Office. If these other projects are not analyzed in detail as project related impacts in Chapter 4 they must none-the-less be analyzed in the Cumulative Impact section, where they have not been in this DEIS.

Page 1-3: How was the eastern edge of the project boundary delineated? Why are the coal leases south of Gillette mostly outside the project boundary, while the Rawhide and Buckskin leases north of Gillette well inside the boundary? It appears that the north-eastern "project boundary" has been overly exaggerated. You are showing potential for CBM development well beyond the burn line where there is no coal. Could you please refine the "project boundary" in this area.

Page 1-5: What do the Onshore Oil and Gas Orders say in regard to drainage and competing leases? Also see above comments on RMP.

Page 1-6: Has the BLM petitioned the WOGCC to decrease the well spacing of CBM wells near active coal mines to mitigate potential drainage issues? If not, why not?

Page 1-6: It appears that this EIS makes no distinction between "wetlands" and "open water habitat". CBM will produce water, when this water is discharged to the surface it will make the land wet. However, it may likely not produce "wetlands", it may in fact flood and thereby decrease existing "wetlands". Could you please address this from the COE jurisdictional status, the EO Protection of Wetlands status, and the BLM Manual 1737 policy. *We note that I.M. No. 99-19 addresses direct physical disturbance to a "wetland" but CBM impacts would be indirect secondary.*

Page 1-13: "BLM is asking operators to submit a water management plan." Could you be little more specific. Will this condition of approval be applied to all federal CBM APD's? Are downstream landowners provided an opportunity to review and comment on these water management plans? *We note that the DEQ/WQD recently permitted CBM discharge under a General Permit effectively limiting an interested party the opportunity to comment on potential impacts.* Will affected landowners be provided a forum through the BLM on federal APD's? If the BLM (currently so) finds that this mitigation is a necessity. Does BLM then have the authority to require the same in issuing a ROW over federal surface to develop private or state CBM? Stated another way: BLM has to approve a ROW for access to private or state minerals, but you do have the authority to require mitigation for adverse impacts. As the surface managing agency will BLM require a water management plan prior to granting a ROW on public land? Likewise where does the Forest Service sit with this issue?

Page 2-2: Triton applauds and supports the BLM's decision to utilize existing two-track roads rather than upgrade to typical BLM road standards.

Page 2-2: The estimated project life is 10-20 years yet your own study speculates an average CBM well life of 12 years? Triton does not have a copy of USDI BLM, 1999a could you please give the corresponding statistics with the "average life", what is the population standard deviation? The sample standard deviation? The mode? How can 3,000-5,000 wells be drilled in a time frame that would allow for an average life of 12 years and all project related impacts occur in a 10-20 year time frame?

Page 2-8: (Please number landscape pages for readability) We agree that CBM production is likely to go into far deeper coals than just the Wyodak. But, where is the analysis of these impacts in this EIS?

Page 2-11: We agree that direct burial of electrical cable should be the preferred method. Will this be a requirement for federal APD's? How about ROW's over public land?

Page 2-13: Water production is expected to average 12 gpm - the statistics please - standard deviation, mode, etc. We also have strong reservations about applying a mean value over such a large project area and in such a variable setting. Applying this assumption to the groundwater model casts a large doubt over the validity of the model output.

Page 2-14: Back to the water management plans. BLM is going to ask for a water management plan? This plan must now address how the water will be managed on a "drainage-by-drainage" basis! Are we correct in interpreting this to mean BLM will require a water management plan for and entire drainage basin irregardless of jurisdiction? Back to a previous question -- is BLM just asking for this or will it be a requirement for every drainage basin prior to issuance of a federal APD and ROW?

Page 2-15: The project life is now getting narrower (see comment page 2-2 above) 12-20 years. You now predict that it is going to take up to 10 years to drill all the wells, but with an average life of 12 years how can those wells drilled in year 10 be realistically gone in year 20? Does the analysis of the projected rate of development here apply only to federal wells or does it include development of private and state wells (the proposed action and impacts do include the private and state wells[appropriately so]).

Page 2-16: The Water Well Agreement. We specifically asked that this be addressed in the EIS during scoping. What authority does BLM have in requiring this agreement? How does BLM know that this agreement has been offered to all affected surface owners prior to approval of an APD? If the COI is ½ mile around each CBM well or the next nearest water well. Does this requirement predict that every landowner in the project boundary with a water well will now be offered an agreement? Do the Operators have to offer the agreement to the same landowner for each and every well? Does each Operator have to offer the agreement to all affected landowners?

Page 2-17: The BLM has rightfully recognized the ongoing detailed groundwater data collection that GAGMO has compiled for the past 19 years and Triton applauds your requirement(?) that the CBM operators form a similar group. This is a large database containing "real data" however, why was this GAGMO data not utilized in the groundwater model? Has

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GAGMO had an opportunity to review this model? What were their comments? Why is the BLM requiring the CBM operators to compile data if you yourself do not then use this data? According to the GAGMO List of Members the BLM is a non-voting government member, which regularly attends GAGMO meetings. Again, why has BLM chosen to ignore this data in preparation of the groundwater model?

Page 2-20: Why is the BLM proposing to provide public (i.e., BLM) labor to monitor CBM monitor wells? BLM does not offer this service to federal coal lessees.

Page 2-22: The Buckskin Mine surface water monitoring station on Rawhide Creek was underwater this entire spring (never happened before). This is a significant impact. Triton has a fine relationship with our adjacent CBM operator and we are confident that we can reach an agreement on this impact. However, other leaseholders may not enjoy such an amenable relationship with a oil and gas company. What specific mitigation is BLM requiring for downstream surface water impacts? Why is BLM proposing that the public (i.e., BLM) share the cost of this monitoring? Again, coal lessees have to burden this monitoring.

Page 2-22: We don't understand how the reference to Caballo-Rojo operating a surface water monitoring station has any relevance to CBM impacts. Is the BLM suggesting that the mines simply monitor CBM impacts?

Page 2-26: Alternatives considered but not analyzed in detail. Are there no reasonable alternatives that could have been analyzed which would have reduced the conflicts between CBM production and coal mining? Again we specifically asked this question in scoping. Drainage is an issue. Why was it not addressed in detail? Why was a 20 acre spacing (or less) not analyzed in conflicting lease areas? The BLM has put off addressing this critical issue for years. Is this not the appropriate time to address this complicated issue? NEPA mandates that reasonable alternatives be analyzed. NEPA mandates that all identified issues be addressed. Tighter well spacing over coal mines would enhance recovery of both coal and methane.

Page 3-1: We agree with your decision that hazardous wastes and paleontological resources do not need to be analyzed in this EIS. We assume a similar decision will be reached for coal LBA's?

Page 3-4: We agree that the Wyodak coal is currently the primary target zone. But, we believe that deeper coals will receive increased scrutiny. We know that there is active on-going work in the [illegible] and [illegible] coal seams. NEPA mandates that reasonably foreseeable future actions also be analyzed.

Page 3-5: Coal mines have hundreds of groundwater monitoring wells completed in coal. CBM activity in close proximity is obviously either venting gas into this area or liberating existing gas by depressurizing the seam. Common sense dictates that adjacent monitoring wells will then vent an increased volume of gas. Is this a safety concern? Is CBM development directly adjacent to active coal operations creating a human health hazard? Where is this addressed? Two wells near our property (one directly adjacent to Highway 14/16 on state land) have recently begun "spewing" methane. This well does not belong to a mine. If (or when) someone leans over one of these wells with a flame there will be an explosion. Likewise, what will happen during the next wildfire that goes through this area? Perhaps BLM should require that the CBM operators purchase all coal monitoring wells and assume this liability. Another reasonable alternative may be to segregate the CBM development from coal mining. It seems reasonable to us that the CBM producers could develop their rights a little further to the west of current coal operations, thereby cutting off the flow of gas to our wells rather than pulling the gas right to them. Either way there will be drainage.

Page 3-11: "Equivalent coal beds in the vicinity of Sheridan." Why is this not analyzed in the cumulative impact section as a reasonably foreseeable future development? The Big George coal seam, are there any reasonably foreseeable future development scenarios for CBM production here?

Page 3-21: USGS 1975 says wells completed in the Wyodak generally yield 10 to 20 gpm and they recognize the extreme variability in water yield. Why does the CBM groundwater model ignore this pertinent data?

Page 3-24: Interesting - mining related withdrawals account for 77 percent of the groundwater use in the study area in Chapter 3. How will this percentage change following projected CBM development? We can not find the corresponding number in Chapter 4, will CBM related withdrawals approach 100 percent of the groundwater usage in the study area?

Page 3-26: We agree Gillette air quality data is representative of the study area and its use would be appropriate for a generic qualitative description. However, the application of generic Gillette data would not be appropriate to plug into a qualitative air quality model. Much more site specific data exists.

Page 3-29: The annual mean PM-10 concentration has decreased as coal production increased. Does your air modeling input continue this documented downward trend in PM-10? A real monitoring data set of NO_2 concentration is available. Using regression analysis with BLM's coal production assumptions what would be the predicted NO_2 concentration in each year projected out over 20 years? How does this projection compare with your modeled projection?

Page 4-1..2: CBM development occurring upstream from surface coal mines could affect coal mining operations. CBM generated water discharge could increase surface flows. If there is any doubt , let me clarify: CBM development is affecting coal operations. CBM discharges are increasing surface flows.

Page 4-2: There likely will be impacts to sediment structures? There will be impacts to sediment structures. We refer you to Chapters 2 and 3 and page 4-5: Water production, on average, should not exceed 17,280 gallons/day/well and flows will increase from 15.1 Mdgal to 66.1 Mdgal; and this is being discharged from dozens of wells into ephemeral streams located immediately upstream of reservoirs designed to hold less than half this capacity. Where is the mitigation for this significant environmental impact? Who will pay to enlarge these reservoirs? We agree that these impacts could be mitigated through cooperative agreements. But, is BLM relinquishing your responsibility and laying this burden on holders of leases that you have issued.

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[illegible]

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Page 4-120..121: Cumulative Impacts: This entire section on cumulative impacts is flawed. The analysis has not projected or analyzed any reasonably foreseeable future CBM development. This must be discussed and analyzed. The proposed project as detailed in the pending southern party will cover the Wyodak project. But, where is an analysis of the CBM development occurring in the Sheridan area? How about that occurring on the western side of the Powder River Basin near Lake DeSmet? How about that occurring in the northern Powder River Basin north of Sheridan in Montana? Local CBM operators are expounding in great detail their current plans and projections in these areas. These plans have been reported in the local newspapers, a "CBM Fair" was even held on July 9-10 detailing these plans. As a matter of fact the BLM operated a booth at this fair, surely you are aware of these projections. Why have these reasonably foreseeable actions not been presented?

This document appears to be attempting to justify the potential impacts from CBM development by repeatedly saying that the impacts will be minimal as compared to coal mining impacts. This is simply not true as is unacceptable in an impartial analysis. BLM must conduct a cumulative impact assessment and you must do it correctly.

Another major mistake revolves around the "cumulative impact assessment area". These areas must be delineated and mapped. These areas must be specific for each specific resource. The BLM has produced a document "Guidelines For Assessing And Documenting Cumulative Impacts" (April 1994). Why were the guidelines in this document not followed in preparation of this EIS?

Page 4-126: The 1995 BLM status sheet did not analyze CBM impacts or development scenarios.

Page 4-126: Specifically what mines are located within the "project area"? Map 1-2 shows the majority of mines to be located outside the "project boundary". Why is the Rochelle Mine located within the project area? Are there current plans by any producer to develop CBM on the Rochelle federal coal lease? It appears that the north-eastern "project boundary" has been overly exaggerated. You are showing potential for CBM development where there is no coal. Could BLM refine the "project boundary" in this area.

Page 4-127: Again, this table is incorrect most of these mines are not located within the Wyodak project area. They are however, located within the vicinity. Why are reasonably foreseeable future CBM wells and associated facilities (mainly large pipelines) not illustrated and analyzed?

Page 4-127: The Rochelle Mine's currently permitted coal production is 22 MM tons not 24 MM tons. The Rochelle Mine annual production in 1999, is their projected 20 MM tons still the "best available information"?

Page 4-128..129: What is the reasonably foreseeable future CBM development in the Powder River Basin above and beyond this proposed project? These developments will be cumulative to the proposed action. You cite Table 2-2, yet this table only projects the current action. Throughout this section you are focusing on cumulative impacts from coal development which is occurring outside the "expanded project area" but, for CBM cumulative impacts you are excluding anything occurring outside the "expanded project area". How about all the new and proposed CBM pipelines and associated facilities, etc. You state that "since 1992, the BLM has prepared five EA's and one EIS analyzing CBM development projects in this area." Using this trend is it reasonable to assume that BLM will be analyzing six more CBM projects over the next seven years?

Page 4-130: How long would it take to "exhaust the coal in the eastern PRB" with reasonably foreseeable coal production? How much of the coal in the eastern PRB is leased? How long would it take to "exhaust the CBM in the eastern PRB" with reasonably foreseeable CBM production? How much of the CBM in the eastern PRB is leased?

Page 4-130: Again, this is the cumulative impact section. When (is it reasonably foreseeable) that all the methane in the "project area" will be depleted? How about the entire PRB?

Page 4-130: What is the cumulative foreseeable CBM production, not just this proposed project?

Page 4-132: Coal companies typically dewater the overburden in advance of mining out the coal seam. CBM discharges will recharge the overburden causing a negative impact. CBM dewatering of coal may reduce the amount of water mines have to deal with in the pit bottom however, our largest water problem involves overburden baseline. We agree that CBM discharges will likely impact existing downstream water management facilities. What specific requirements will BLM mandate to mitigate these impacts? And who will be responsible for this mitigation?

Page 4-133: Speaking of Keyhole Reservoir, What will be the cumulative impact of sedimentation with the reasonably foreseeable future action (RFFA) CBM discharges? Will it require dredging in the foreseeable future?

Page 4-134: Again, what is cumulative reasonably foreseeable CBM impact? The existing related groundwater impacts are of a complete different type and scale. Mining does remove a very small (insignificant?) portion of the upper Wyodak aquifer. Cumulative CBM development may lower the water level in numerous coal aquifers throughout the PRB. Intuitively, the groundwater drawdown from cumulative CBM development will quite simply dwarf the existing related drawdown. What is the groundwater recovery period for the cumulative CBM dewatering. Do some of the deeper coal seams that are and will be dewatered by CBM even have a recharge zone? And if so what is it?

Page 4-135: "CBM development may change the timing of coal extraction but would not affect sustainable development of the resource." Would you please expand on this statement. Does BLM predict that a coal mine or coal mining in general will be slowed down as a result of the proposed action? Alternative A? Does BLM predict that approval of the proposed action will indirectly shut a mine down? If so, which mine? And what will the socioeconomic impacts be?

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Page 4-136: The statement that "This EIS describes anticipated impacts using the latest available information." is simply not true and is the major reason this analysis fails to comply with NEPA. This statement occurs in the cumulative groundwater section. Coal mines have an extensive database, which if utilized in the groundwater modeling would have contributed significantly to the analysis and quite probably altered the conclusions. Please see specific comments submitted by GAGMO.

Page 4-136: This is the cumulative impact section, where is the analysis of RFFA of CBM production? What is the recharge mechanism for the deeper coal seams that are and will reasonably be expected to be dewatered by CBM production? What will the drawdown in these deeper coal aquifers be? How long will it take water levels to recover in these deeper seams (Redstone Resources north of Gillette is actively exploring the "Dunes" and "Blue" coal seams, in fact they are installing multiple well heads at many drill locations. Have the associated cumulative surface discharges from these multi-well sites been addressed?). Approval of the action analyzed in the EIS will not limit development to the shallow Wyodak seam, where is the analysis of impacts to these deeper seams? CBM producers are not hiding these plans from the public, they are well know. Did BLM use the "latest available information" in preparation of this EIS?.

Page 4-139: The BLM is again diverging from the analysis that must be completed for this project. CBM development will overwhelm and dwarf the groundwater drawdown produced by coal mining. This is not an analysis of coal mining, but CBM. The statement that "additional groundwater impacts that would be expected as a result of the Wyodak CBM development would be additive in nature and would extend the area experiencing a loss in hydraulic head to the west of the coal mining area", can be nothing more than an attempt to downplay the significance of the groundwater impacts that this project will elicit. Rigorous and detailed modeling conducted in association with state mandated requirements at coal mines using "real data" collected over 20 years by very closely spaced wells (in excess of 600), monitored semi-annually, has essentially proven that groundwater impacts from coal mining are relatively insignificant. CBM production is now occurring with virtually [or relatively] no monitoring, very little real data exists at this time to substantiate and refute predictions made. Yet the BLM states additional groundwater impacts would be expected and they would be additive in nature to coal mining? Here is some real data for your analysis: The Buckskin Mine has monitored groundwater levels in the upper coal seams for 20 years and published these results in publicly available Annual Reports. Our surface mining operation has obviously acted like a sump and caused groundwater to flow in the direction of our pit. Water levels in over 30 surrounding coal monitoring wells have shown virtually no drawdown over this monitoring period. This past year (one year) we recorded drawdown in two coal wells in excess of 100 feet, the groundwater flow direction has now changed direction from being centered on our pit to an area with concentrated CBM production. Again, this occurred over one year and the CBM field is not fully developed. The BLM says CBM will be additive to the coal impact?

Figures 4-19 and 4-20 should be in the previous section on project specific impacts. The statement that "the maximum areal extent of drawdown…ranges to the west about 12 to 22 miles from the centers of CBM development" may be accurate for this project. But, the cumulative impact of all reasonably foreseeable future CBM development in the PRB will obviously exasperate this drawdown. Figure's illustrating the projected groundwater drawdown's in each coal aquifer need to be presented that include RFFA CBM production. What is the recharge mechanism for the deeper coal aquifers and what is the expected recovery period?

Page 4-140: Again, where is the projection for RFFA CBM development in the analyzed air shed? The July 11, 1999 Gillette News Record reported the on the extensive CBM associated pipeline construction and associated compressor stations? The news article says "industry leaders estimate the pipelines will carry 6 trillion to 12 trillion cubic feet of methane gas out of the basin's coal reserves." This compares to the EIS estimate of some 2 trillion cubic feet total. The same article continues to quote industry leaders as stating the life of the play is some "20 to 30 years" not the 10 to 20 years as the cumulative impact section states, why does the BLM not recognize that additional CBM development above and beyond this Wyodak project is and will occur?

The air model used in this analysis appears to be "state of the art". The consultant air modelers appear to be highly qualified to run the model. But, who provided the model input data in regard to cumulative impacts and who interpreted, summarized, and presented the modeled output? Modeled results are only as good as the input and interpreting the modeled results must be done correctly.

Page 4-140: A major flaw with the cumulative air quality analysis revolves around BLM's lack of consideration of incremental reductions in emissions. These reductions are "reasonably foreseeable future actions" in fact they are currently being proposed by the EPA as mandatory. Cumulative impact analysis requires analyzing RFF Actions not just RFF Developments (this is clearly stated in BLM's Guidelines for Analyzing and Documenting Cumulative Impacts 1994). An action by EPA which would reduce emissions must be utilized in this analysis to predict long-term cumulative visibility impacts. The BLM's own internal documents also specify that a cumulative impact analysis is not to be a "worst case" analysis, but rather a "most reasonable" analysis. Through out the cumulative air analysis the tendency appears to revolve around using worst case projections for coal and railroads and best case projections for CBM. This situation must be rectified.

Another major flaw with the air analysis (or more precisely the interpretation of the model output) revolves around the projected emissions and resulting impacts from coal mines and coal trains. The modeled emissions are not annual emissions as continually stated in text and tables, they are projected worst case emissions in the year 2015. If the BLM wishes to present a clear and concise document to the public that is not misleading you must present a table illustrating by year the modeled emissions and corresponding visibility degradation. By your own analysis all of the CBM production and resultant emissions will be finished in the year 2015, which is the only year modeled for coal emissions. The basic question a federal land manager needs to know for air quality related values is - if this project is approved, will the visibility be significantly impacted next year? The following year? How about subsequent years? Simply picking one arbitrary point in time some 20 years in to the future and telling the public that this will be the visibility not reasonable. Does the BLM honestly believe that the results presented by this cumulative model are accurately predicting the visibility at Wind Cave National Park in the year 2015? If so, please clearly support this contention with conventional logic.

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Figure 5-1 Cumulative Modeling Domain in the Air Quality Technical Report was extremely helpful to one to put this analysis in perspective. We believe it should be added to the Final EIS. However, this modeling domain raises some obvious questions: Where are the mines in the northern PRB?, Is the Coal Strip Power Plant not in this domain?, Why was Billings (which appears to be only a few miles away) not included? How about the refinery at Newcastle? Rapid City is located immediately north of these Class We areas – there are no anticipated future emissions from Rapid City over the next 20 years? Does not the proposed DM&E railroad go right through this area? Where are these projected emissions? The point we are trying to make is that any reasonable person could easily see (by looking at Figure 5-1) that the modeled cumulative emission sources are clearly targeted at the Gillette area coal mines and no reasonable person would place much confidence in the 20 year predictions made in this EIS.

The IWAQM Phase 2 Summary Report made a strong recommendation that "Regional Committees be formed to assist in the resolution of the myriad of decisions associated with mesoscale modeling of PSD and AQRV impacts". Do the modelers feel that this recommendation was fulfilled with this modeling effort? To quote the IWAQM report "as in any air quality simulation, the usefulness of the results obtained depends mostly on the expertise brought to the analysis in characterizing the situation, and on the expertise applied in interpreting the results obtained." IWAQM states that "application of the CALPUFF modeling system to any situation will require expert judgement, it will likely involve site-specific decisions, and it will require strong interaction and coordination with the applicable reviewing authorities." Again, We would like the modelers (EnviroNet AeroScience, LLC) to address any questions about the interpretation of the results, the characterization of the situation, and the site-specific decisions regarding input parameters.

Quoting another source, The EPA published *Response To Peer Review Comments Of The Interagency Workgroup On Air Quality Modeling Phase 2 Summary Report And Recommendations For Modeling Long Range Transport Impacts* "the reviewers recommended that it be made clear that this technique is applicable for one or several closely spaced sources of emissions, not for multiple sources that are widely spaced around Class We areas." We believe it is imperative that the BLM provide the EIS reviewers and BLM decision makers with similar cautions about the results predicted in this EIS.

The IWAQM report also states that "CALPUFF is most easily applied for isolated new emissions, and becomes more problematic as the number of sources increases. This supports limiting application of CALPUFF to a relatively few sources of emissions, so that the 'background' levels can be derived using appropriate monitoring data." Does the BLM honestly believe that the results presented by this cumulative model are accurately predicting the visibility at Wind Cave National Park in the year 2015? How about the modelers, do they? BLM must caution the reviewers and decision makers that this sophisticated mesoscale meteorological model uses a very uncertain science and that the further out in time projections are made (We.e., 20 years) the results may be highly suspect.'

How long was the model run in this analysis? A month, a season, annually, or for 20 years? Likewise how many 24-hr averaging periods were analyzed against the background condition?

The deciview change associated with adding a new source's effects onto an existing background haze effect is computed by using the extinction coefficient associated with the background (We.e., visibility is fundamentally a function of the existing background condition). What extinction coefficient was used for the background condition in the year 2015 (which is the year all coal related emissions where tied too)? And again are the modelers comfortable with these values?

Coal mines have documented that PM-10 emissions have and continue to decrease with the corresponding increase in production. Did the model input decreasing PM emissions from coal mines or did it input increasing emissions?

Table 2-1 only predicts Wyodak CBM compressors, how about other foreseeable CBM compressors, pipeline compressors, etc...

Item No. 4 and No. 5 under *Near-Range Cumulative Emission Inventory* says "incremental increase in surface coal mining emissions" and "rain emissions". This increment is not an annual increment but rather a 20 year increment. Why were no incremental decreases in emissions modeled, as is being mandated by EPA?

Page 4-145: Table 4-16 This table is not annual NOx emissions. The coal mine and coal train emissions are not tons/year, but are projected tons in year 2015 and again, in 2015 the Wyodak CBM project is projected to be finished.

Page 4-146: BLM states that "However, the EPA has mandated a 46% reduction in locomotive NOx emissions by the year 2007." The response BLM received from Burlington Northern with model inputs from trains very specifically called out BN's mandate and plans to reduce NOx emissions (Appendix E in the Technical Report). The Technical Report Appendix D Emission Factors for Locomotives also utilizes this predicted lower emission rate. Why was this lower emission rate not deemed reasonably foreseeable and input into the model? Likewise those mines that show a projected decrease in coal production from the baseline year – Why were these decreases not input rather than using a "0" value?

Page 4-147: Far-Range Air Quality Impacts - See above comments.

Page 4-149: The regional haze impacts from coal mining and coal trains are projections based on estimates at the year 2015. These estimates do not include any projections for decreasing emissions, either from the mines, from cleaner burning locomotives, or from any decreasing baseline emissions over the 20 year period (We.e., very worst-case analysis). Why are no RFFA as far as cleaning up regional haze (ie. PM 2.5, ozone, etc..) projected in the analysis?

Page 4-150: Table 4-19, Title of table is incorrect and misleading. This is the Projected Air Quality Impact Analysis in the Year 2015.

Page 4-150: Table 4-20, Same as above predicted to occur in the year 2015.

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Page 4-151: Table 4-21. Same as above predicted to occur in the year 2015. Could you also correlate wind direction with the predicted number of days deciview changes are greater than 5%. Does the wind in Gillette even blow from the west-northwest often enough to account for the 136 days at Wind Cave? Likewise by glancing at Figure 5-1 in the Technical Report you notice that the wind must be blowing from the southwest near the southern group of mines at the same time it is blowing from the northwest at the northern group to produce this predicted cumulative impact. Speaking of wind direction- there have to be some fairly major wind swirls for any cumulative coal mine related impact at Devils Tower. How is this reasonably possible? Please clearly support the rational for the model assumptions.

Page 5-3: NEPA specifies that the experience of each contributor be identified. Please specify the experience each of the air quality contributors have with running sophisticated mesoscale meteorological models and interpreting and evaluating the corresponding results.

__Air Quality Technical Report__

Page 2-8: Table 2-3, the projected potential coal production increase __is not__ MMT/yr it is MMT in year 2015. For instance Buckskin's projected annual increase would be 0.3 MMT/yr not 5.3 MMT/yr. Mis-application of this table was correspondingly carried over into the EIS.

Page 2-9: Table 2-4, see above.

Page 2-10: What emission factor did you calculate and use for tons of NOx per MM tons coal? And how does these number compare to the "real data" of 16.5 ppm NOx for the base year in Gillette? Why were mines with projected decreases in coal production assigned a value of 0.0 ppm emissions rather than negative emissions?

Page 2-11: Table 2-5 and corresponding text. Again the same mistake was made. These numbers __are not__ annual increases, but rather one increase over a 18 year period.

Page 4-2: Table 4-1 and corresponding text. See above for coal mines and trains. Are the Wyodak Compressor and Other Point Sources tons/yr or some other unit as well?

Page 4-3: Again, the projected emissions for coal mines are not annual emissions but rather projected emissions in the single year 2015. Ditto again for the coal train emissions.

Page 4-8: Could you explain, in greater detail, the rational for adding 16.4 ppm to all receptor grids within 3 km of the track?

Page 5-3: Did the CALMET model assume the wind was always blowing the same direction and speed at each coal mine (mines that spread over some 60 miles)? If so, just how reasonable is this assumption? And what impacts would this have on the modeled visibility?

Page 5-23..35: See previous comments on annual emissions vs 2015 emissions.

One last comment – I am now sitting on my deck at sunset reviewing this rather lengthy letter. Is the BLM going to require that CBM operators spray for mosquitoes?

Triton Coal Company has reviewed this EIS in detail. We have no desire to shut down or even slow down CBM production. In fact, we would rather see it accelerated. However, this EIS as currently presented fails to adequately separate CBM impacts from coal mining impacts and as we feel it is both legally and scientifically deficient. Thank you for the opportunity to provide comment and additional data. We look forward to reviewing the revised FEIS.

Sincerely,

Scott Benson
Environmental Engineer

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WYOMING MINING ASSOCIATION

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P.O. Box [illegible]
Cheyenne, Wyoming
[illegible]

July 12, 1999

BUREAU OF LAND MANAGEMENT
14 [illegible]
[illegible]

Mr. Richard Zander
U.S. Department of the Interior
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Re: Comments on the Wyodak Coal Bed Methane Project Draft EIS

Dear Mr. Zander:

The Wyoming Mining Association (WMA) represents bentonite, coal, gold, trona and uranium companies and the mining associates (vendors, suppliers and contractors) in Wyoming. It is on behalf of these members that the following comments are submitted.

The draft EIS contains an unprecedented extent of observations and conclusions about coal activities commingled in the text with those about the actual focus of the EIS– i.e. coal bed methane activities. The results are unacceptable due to the different levels of refinement used to characterize the different activities. These issues are discussed in Section A of the comments.

Numerous technical concerns were identified by the WMA review of the draft EIS. These principally deal with air and water issues, and are discussed in Section B of the comments.

Additionally, procedural concerns were noted by WMA regarding the EIS treatment of potential conflicts and availability of documents supporting EIS models and conclusions, possible adverse interactions between coal bed methane development and coal mining activities. These procedural issues are detailed in Section C of the comments.

R. Zander
July 12, 1999
Page 2

A. [illegible]

The treatment for coal mining and coal transportation in the air and water modeling efforts contain several flaws, questionable assumptions, and highly questionable approaches, that produce unreliable results. As such, the quantitative results and inferences related to these activities can not be accepted. These issues are discussed in the detailed comments of Section B below.

Some of the issues appear related to the lesser levels of accuracy and refinement for coal related sources. Since this is an EIS for proposed coal bed methane actions, the reduced attention to accuracy and detail for coal mining and transportation activities is somewhat understandable. However, the exaggerated projections of coal related impacts can not be accepted. These results are included in the report as equivalent to those derived from the much more refined coal bed methane treatment, conveying a basis for equivalent validity and interpretation. This is completely unacceptable. It is incumbent upon BLM to assure that the published results in the EIS do not provide a basis for misinformation or misinterpretation. Coal related impacts must be reevaluated with equivalent refinement and accuracy.

To address the parallel needs for expediency in processing this EIS and ensuring accuracy in published results, the BLM must revise the Introduction and Cumulative Impact sections of the EIS to:

(1) Clarify that the modeled air quality impact projections for coal related activities are inconsistent with the actual observed effects of expanding coal activities over the last 20 years.

(2) Clarify the differential modeling treatments between coal bed methane and coal mining and transportation.

(3) Acknowledge the significant issues raised by the coal industry regarding assumptions used and modeling results for projected coal related impacts.

(4) Clearly state that the coal related results of air modeling are only preliminary, that the results remain under review and should not be referenced or interpreted until future resolution through the next coal related EA or EIS action.

(5) Revise the groundwater modeling discussions and results through remodeling efforts addressing the substantial insufficiencies and flaws identified by the Gillette Area Groundwater Monitoring Organization.

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For pending and future coal action EAs and EISs in the region, do not incorporate this model, but substitute the approved groundwater model(s) currently included in the mining permit(s) located in the immediate vicinity of the proposed actions. These models will contain more details and area-specific groundwater projections for the locations of the proposed actions. Extensive cumulative aspects of these existing models and results will address the needs of cumulative impact assessments within the applicable coal action EA/EIS.

(3) Separately address the direct and attributable impacts for the proposed coal bed methane activities.

This approach should allow the EIS process to continue, while also allowing resolution of the technical and related issues raised by the document.

The significant technical issues, detailed in Section B. below, are sufficiently compelling to require a substantial modification of the results and discussions in the EIS document. The procedures suggested above will allow these issues to be adequately addressed while expeditiously continuing the process for the proposed coal bed methane actions. If these procedures are not possible, each of the technical issues represents a substantial cause for administrative reevaluation and significant revision to the EIS and need to be addressed prior to any further action on the proposed activities.

In either case, the broader scope issues outlined in Section C below will need to be addressed within the current EIS process.

B. TECHNICAL ISSUES

1. Air Quality Issues

(a) Modeling procedure concerns for train and coal related emissions:

(i) Coal train emissions comprise 84% of modeled Far-Range NOx emissions, the largest delineated emission source (Table 4-17). Preliminary review of the modeling indicates that train emissions were not modeled realistically. Rather than modeling the trains as continuous low-level emissions, the modelers chose to depict the trains as cumulative fixed sources at intervals along the rail line. This treatment produces exaggerated emissions at these fixed locations, producing unrealistically high readings at any nearby receptors. This needs to be corrected through revised modeling efforts.

(ii) Coal locomotive fuel usage rates applied to the Near-Range and Far-Range models appear to be unrealistically high, approximately 23 gallons of diesel per rail mile, rather than the 5 to 9 gallons suggested by the supporting documentation in the draft EIS. Corresponding emission rates are thereby significantly exaggerated, exacerbating the overprediction modeling effects. These must be corrected through revised modeling efforts.

(iii) Modeled locomotive emissions fail to account for mandated reductions in emission rates during the modeling period. In a memorandum dated January 12, 1998, the EPA suggests that modeling of locomotive emissions should include emission reductions resulting from court ordered standards. These reductions range from 7.9% in the year 2000 to 48.3% for year 2010. The draft EIS acknowledges on Page 4-148 that modeling did not account for such decreases in locomotive NOx emissions. However, by not using these EPA Air Quality Guidelines, the emissions associated with coal transportation are significantly exaggerated in the results presented in Tables 4-17 and 4-18, and all associated conclusions. This is a substantial flaw in the strategic assumptions and modeling processes. To assure the most accurate model results possible, the BLM needs to remodel these emissions, using the mandated standards.

(iv) The cumulative analysis for visibility impacts from NOx, SO2 and PM10, as described on pages 4-140 to 4-152, focuses only upon emissions estimated for CBM activities and coal mining related activities. The only mobile sources considered are road dust from CBM vehicle traffic, mining vehicle exhaust and coal train locomotive emissions.

The modeling exercise fails to account for impacts from exhaust emissions from CBM vehicles, and for exhaust emissions from general public vehicles. This latter source particularly needs to be considered relative to visibility impacts at the Class I and Class II areas in the analysis. Strong vehicle use rates at several of these sites (e.g., Badlands National Park, Mount Rushmore National Monument, Devil's Tower National Monument, etc.) during the

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higher NOx-ozone reactions must be considered in any impact analysis.

(b) Technological advances in reducing emissions from larger mining haul trucks (300-ton capacity and greater) has resulted in equivalent [illegible] as [illegible] engines. Several trucks of this category are in use in the Powder River Basin. NOx and PM10 emission reductions similar to the EPA guidance mentioned in (a)(ii) above should be used in remodeling diesel emissions from mine haul trucks. In addition, these larger trucks will facilitate moving the same equivalent tonnage with fewer trucks, resulting in further reduced emissions. The modeling of fugitive PM10 emissions from coal mining truck haul did not account for these factors. Remodeling efforts need to embrace this evaluation.

(c) The cumulative emissions for far-range air quality analyses (Table 4-17) include estimates of NOx emissions from blasting Ammonium Nitrate and Fuel Oil (ANFO), a generic term used to describe a wide range of high explosives such as those used at coal mines. However, the AP-42 emission factor used for coal mining blasting activity in the air quality model was based on a small number (about 50) of test shots conducted by the Bureau of Mines in 1974 ([illegible]) to simulate underground mine conditions. This study used a straight ammonium nitrate and fuel oil mixture, which ranged from 0 to 10% fuel oil. The EPA stated in this AP-42 that "Any estimates of emissions from explosives use must be regarded as approximations that cannot be made more precise". Due to technological advances, combinations of ANFO and emulsion blends are more commonly used in the Powder River Basin because they are more efficient than the straight ANFO used in the 1970s.

The explosives described in the AP-42 for ANFO are not the same explosives used today. Many explosive manufacturers believe this AP-42 is too conservative to be used in this manner. In lieu of a more accurate emission factor, the EIS needs to directly acknowledge the inaccuracies inherent to the emission factor used.

2. Water Issues

(a) The EIS outlines utilization of two 1997 Wyoming Water Resources Center groundwater models to assess impacts. One of these is an unpublished document, and is addressed in comment (b) below. The other is a model that the Wyoming Department of Environmental Quality, Land Quality Division evaluated in 1997 and determined to be useful only as a reference work, not as an acceptable modeling tool for groundwater drawdown projections. Based on that evaluation, the model utilized for this EIS is inadequate to predict groundwater impacts. Modeling through an appropriate and acceptable method must replace the existing assessment within the EIS.

(b) Pages 4-1 and 4-2 of the draft EIS state that "CBM development occurring upstream from nearby surface coal mines would affect coal mining operations. CBM generated water discharged upstream from coal mines would increase surface flows in the vicinity of coal operations or decrease the rate of groundwater withdrawals that currently accompany ongoing coal mining operations. There likely will be impacts to sediment structures in the coal mine permit areas. These structures have been designed to accommodate historical flow rates that do not include contributions from CBM generated flows. Some design aspects of mining operations may need to be changed. Any required revisions to approved mine plans would impact operators and agencies involved in reviewing proposed changes."

This discussion implies several disturbing and unrealistic assumptions. First, that coal mine operations will accept the burden of CBM discharge runoff. Second, that coal mine operations will change some structural designs for ponds and drainages to accommodate CBM discharges. Third, that coal mine operators and related regulatory agencies will conduct coal permit changes to accommodate CBM activities and discharges. These assumptions raise clear questions of trespass, offsite damages and illegally imposed burdens. BLM must revise this section by removing these assumptions or by adding clear directions that CBM operators must obtain appropriate landowner consent prior to any discharge, to address any and all of these projected impacts.

(c) Comments submitted July 6 by the Gillette Area Groundwater Monitoring Organization have identified numerous concerns regarding the insufficient model calibration, inaccurate modeling parameters, and inappropriate assumptions in the groundwater models and results of the draft EIS. The review by that group resulted in a determination that the EIS groundwater model must be rejected and a new model constructed to address several deficiencies. WMA concurs with these points of concern, and agrees that BLM must address them through remodeling prior to finalization of this EIS process.

C. PROCEDURAL ISSUES

1. Conflict Resolution

In addition to the technical issues discussed above, the draft EIS document raises issues regarding potential conflicts between energy development interests. The EIS contains the following statement at page 4-2:

> "Conflicts between CBM drilling and existing or potential surface coal mining may occur. Development of CBM wells should be precluded in areas of active or impending coal mining. Locating wells in areas where future mining may take place would preclude mining during the life of wells located in the proposed mining area. Coal in these areas could be mined after CBM extraction is completed or terminated, or after an agreement is negotiated between the CBM operators and the coal mine operators."

This language fails to consider all alternatives and to complete a social economic impact analysis as required by NEPA on BLM's apparent policy decision to prohibit surface coal mining from expanding into areas where coal bed methane production may be occurring. Based upon the broad geographic application of this EIS and the projected CBM development thereunder, such a prohibition policy could in fact prevent any and all expansion of all existing surface coal mine operations within the Powder River Basin, until such time as the coal bed methane has been extracted. BLM should conduct the requisite social economic impact, which would appropriately take into consideration the relative economic impacts to federal, state and local economies of the financial gains realized from both surface coal mining and coal bed methane extraction.

BLM should not utilize the EIS to adopt an apparent policy regarding surface coal mining and coal bed methane extraction. Independently of the EIS process, BLM should develop comprehensive guidelines that recognize (1) the relative economic values in the production of coal and the production of CBM, (2) the relative values of the investments heretofore made and hereafter to be made by the coal mining operators

and the CBM operators, (3) the BLM obligation concerning the maximum economic recovery of resources from public lands, (4) BLM's statutory and regulatory obligation regarding multiple mineral development and (5) the common law right of one mineral developer to reasonably and necessarily impact other mineral developments (see recent United States Supreme Court decision of Southern Ute Indians v. Amoco). For these reasons, BLM should delete the quoted language from the EIS.

2. Unavailable Information as a Basis for Modeling Results

Pages 4-138 and 4-139 of the Groundwater section indicate that "An assessment of groundwater impacts for Lighthouse CBM development in the eastern PRB was performed . . . but the results have not yet been published. Information from this work was used in the compilation of the EIS where appropriate." The Lighthouse project was approved 4 years ago; why is the groundwater impact assessment still unavailable? Use of this unpublished information, vague references to use of some of this information in the current EIS analysis, and failure to include the specific information from that study in this groundwater analysis is unacceptable. That procedure denies any reviewer the right to verify the assumptions and/or results of the computer analyses. This is not acceptable. BLM must make this information available for public review and comment prior to completion of the EIS comment process.

The Wyoming Mining Association appreciates the opportunity to comment upon the draft EIS. We request that these points be taken into consideration during preparation of the final EIS document.

Sincerely,
WYOMING MINING ASSOCIATION

Marion Loomis

Marion Loomis
Executive Director

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Office of Federal Land Policy

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BUREAU OF LAND MANAGEMENT
JUL 15 1999
BUFFALO FIELD OFFICE
BUFFALO WY

July 14, 1999

Richard Zander
BLM, Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834-2436

Re: Wyodak Coal Bed Methane Draft Environmental Impact Statement

Dear Mr. Zander:

Enclosed you will find comments from the Wyoming Department of Environmental Quality's Land Quality Division. Please incorporate these comments into the packet sent to you on June 18, 1999 from the State of Wyoming. Thank you.

Sincerely,

Julie L. Hamilton

Julie L. Hamilton
Planning Consultant

Enclosure

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THE STATE OF WYOMING

JIM GERINGER
GOVERNOR

Department of Environmental Quality

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

MEMORANDUM

TO: Julie Hamilton, State Farm and Loan Office

FROM: Dennis Hemmer, Director, Department of En[illegible]

DATE: July 12, 1999

Please find attached our comments on the proposed Wyodak Coal Bed Methane Project and Draft Environmental Impact Statement (EIS) and Ground Water Modeling Technical Report.

BUREAU OF LAND MANAGEMENT
JUL 15 [illegible]
[illegible]

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MEMORANDUM

TO: Dennis Hemmer

FROM: Richard A. Chancellor

SUBJECT: Proposed Wyodak Coal Bed Methane Project
Draft Environmental Impact Statement (EIS) and
Ground Water Modeling Technical Report

DATE: July 12, 1999

The following comments are based on the Land Quality Division's (LQD's) review of the Draft EIS and associated Technical Report (Ground Water Modeling). Due to time and budget constraints, we have focused our comments on those portions of the EIS which relate to hydrology.

1.0 GENERAL COMMENTS

1.1 Coal Mine Permits. The proposed, extensive Coal Bed Methane (CBM) development will have a significant impact on the permitting and bond release activities of the LQD, which regulates coal mining in the State. To meet both federal and state requirements, coal mines must provide comprehensive surface and ground water information as part of their mine permit applications. This information establishes baseline (pre-mine) conditions and is used to determine potential impacts of mining on the hydrologic balance and to evaluate reclamation success. Because CBM development will impact both the surface and ground water hydrology, it will be difficult or impossible to determine true baseline and to evaluate changes over time.

For ground water, the anticipated magnitude and extent of the CBM will result in continued declines in the ground water elevations during that development. In addition, the rate and geographic distribution of the declines will vary because the CBM development will not progress uniformly. As a result, the ground water elevations will be a 'moving target', difficult to measure accurately, particularly considering the limited number of CBM monitoring wells. Therefore, while the mines can predict the drawdown and recovery during and after mining, they will no longer be able to evaluate the accuracy of their predictions. For surface water, the discharge of water into drainages by CBM activities will artificially enhance surface water flow and possibly create artificial wetlands and Alluvial Valley Floors (AVFs). However, both wetlands and AVFs must be addressed by the mines in their Mine and Reclamation Plans. For existing mines, changes in their existing surface water diversions and reclamation plans, that were designed before CBM development, may be necessary. In contrast, new mines would need to 'over design' for increased surface water flows that might not be present throughout the life of the mine.

In summary, the coal mines may no longer be able to fulfill their regulatory requirements for evaluating the impacts of their mining activities and operational data needs, such as surface water quantities which must be diverted. Unless provision is made for more comprehensive collection of data and evaluation of impacts due to CBM development, and for the additional burden for coordinating the collection and evaluation efforts by the two industries, the mines can only provide a small part of the picture of the hydrologic impacts in the Powder River Basin. Similarly, the burden for determining if mine operations will be impacted by CBM activities appears to be on the mines.

1.2 Impermeable Layers. The evaluations in the Draft EIS and Ground Water Technical Document rely heavily on hydraulically 'isolating' the coal layers of interest from over and underlying aquifers. In the model, the confining layers above and below (Layers 3 and 7, respectively) the coal layers have been assigned very low vertical hydraulic conductivities, apparently uniformly. As noted in LQD's review of Wyoming Water Resource Center's 1997 study, LQD does not consider that field lithologic or hydrologic data supports the presence of a laterally continuous confining unit with such a low hydraulic conductivity throughout the Powder River Basin.

LQD acknowledges that the vertical conductivity between the coal seams of interest and the overlying aquifers is low; however, LQD considers a value of 1×10^{-10} meters per second throughout the Powder River Basin unrepresentative of lateral variations in the sedimentary and structural environment. Mention is made on Page 4-41 of monitor well data; however, no vertical conductivity values have apparently been calculated from this data. Mention is also made on the same page that the presence of methane in the coal seam is evidence of the confining layer. As noted above, the lateral continuity of this layer is questionable, considering that upward migration of methane gas has been a problem in some areas of the Powder River Basin, such as at Rawhide Village north of Gillette.

1.3 Discharge of Produced Waters (Draft EIS, Page 4-135; Technical Document, Page 8-1): The text on these pages includes a comparison of the quality of water discharged from CBM to that discharged from coal mines. While it may be true that the discharge from CBM may be of a higher quality than the discharge from the mines, the discussion implies the discharge from the mines is of poor quality and adversely impacts the quality of water in alluvial and shallow Wasatch aquifers. It should be noted that discharge from the mines must meet NPDES standards and there is no evidence of mine discharge negatively impacting alluvial or shallow Wasatch aquifers. The discussion should be modified.

1.4 Ground Water Recovery (Draft EIS, Page 4-43): Water level recovery is given short shrift in this evaluation. It is stated on Page 4-43 (1st full ¶) that the amount of ground water in storage outside of the CBM development area is "enormous", but no quantities are apparently estimated or compared with the quantities of water that will be removed from the aquifers in the CBM development area. (Table 3-2 in the Ground Water Technical Document provides estimates of the quantities of water that will be pumped out by CBM development; however, these quantities are not compared with the quantity of water in storage outside the CBM area, recharge rates, or any other values that could affect recovery.)

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Statements about recharge at mine sites also need clarification. The statement on Page 4-43 (2nd full ¶) that diversion of creeks over the backfill areas will provide for recharge ignores the fact that the mines must restore the hydrologic balance of the surface water systems. In other words, if surface water originally *flowed across* a mine site prior to mining, then an equivalent amount of water must *flow across* the mine site after mining and reclamation. Any differences in pre-mine and post-mine conditions must be evaluated to determine impacts to downstream users and to determine if these impacts must be mitigated. Therefore, the EIS is apparently relying on a recharge source that may not exist. Similarly, the text also mentions that the mine backfill areas can serve as recharge areas in the long term. However, considering that the mines predict recovery time frames of several hundreds of years, LQD does not consider it realistic to assume that the backfill areas will act as recharge areas within any reasonably foreseeable time frame.

This comment is not meant to suggest that the ground water withdrawn during CBM development could not be used to enhance recovery of the aquifers in the Powder River Basin. Several innovative possibilities exist, such as storing the pumped water for later use for recharge of the mine backfill areas or reinjecting the water elsewhere in the basin for long-term storage (e.g., water banking). It is suggested that such alternatives be evaluated in more detail as part of the EIS process. See Comment 2.2.3 also.

1.5 Cumulative Assessment (Draft EIS, Pages 4-132 through 136; Technical Document, Section 8.0): Rather than an assessment of the impacts of CBM development, these sections appear to be a comparison of CBM and mining impacts, with the implication that the impacts of CBM development are less than those of mining. Both mining and CBM development should be evaluated 'on their own merits'. However, if this type of comparison remains in the Technical Document, then the magnitude and extent of the CBM development impacts throughout the Powder River Basin should be compared with those of the coal mining, which has occurred primarily on the eastern margin of the basin.

1.6 Editorial Comments:

a) Review of both the Draft EIS and Ground Water Technical Document was complicated by the lack of legible and/or appropriately labeled figures and maps. For example, on Figure 4-9 on Page 4-40 of the Draft EIS, the 'triangle' data points are not legible. On most of the maps in the Ground Water Technical Document, there are no legends.

b) Draft Page 7-1, Ground Water Technical Document: Technically, there is no Cordero Rojo Mine. There is a Cordero Rojo Mine and a Cordero Mine. Even though they are operated as the Cordero Rojo Complex it would be helpful to distinguish between the two mines of the complex.

c) Comparison of the measured and model results would be easier if the relevant portions of Figure 5-7 had been shown on additional figures at the same scale as Figures 5-5 and

5-6.

2.0 TEXT SPECIFIC COMMENTS

2.1 Draft EIS

2.1.1 Moyer Springs (Page 4-19, 2nd full ¶; Page 4-20, 3rd full ¶; Page 4-42, 3rd full ¶): The Draft EIS discusses a low permeability contact zone between the coal and the clinker supplying water to Moyer Springs. The LQD is not confident that this zone provides the protection to the Spring that the Draft EIS indicates. The LQD has conditioned the Dry Fork Mine Permit to leave a buffer of coal next to the clinker to provide additional protection until the interaction between the coal and the clinker is better understood. The LQD fears the CBM development in the area will adversely impact the Spring before this relationship is understood. It is suggested that a large buffer be established around the Spring until further studies are conducted to ensure the Spring is protected.

It is also not clear how the discussion about the low permeability contact zone on Pages 4-19 and 4-42 of the Draft EIS relates to the discussion about the recharge zone on Page 4-20 of the Draft EIS and in Section 4.3.2 on Page 4-8 through 4-10 of the Ground Water Technical Document. The text on Page 4-20 discusses the 'transition' of the coal to the clinker, without mention of the contact zone. Similarly, although Figure 4-5 of the Technical Document is difficult to read due to the lack of a legend, it appears that the extensive clinker aquifer which is the source of Moyer Spring is considered part of the coal recharge zone. The apparent contradiction should be addressed.

2.2 Ground Water Technical Document

2.2.1 Steady-State Calibration (Page 5-1 & Figure 5-1): In the evaluations of the ground water models submitted by the coal mines, LQD has generally considered a water level calibration within +/- 10 feet as an appropriate "benchmark". In some areas that are more difficult to model, 'looser' calibrations on the order of +/- 20 feet may be considered adequate. Therefore, LQD was surprised that the model could be considered 'calibrated' when, at the calibration wells, the majority of the modeled heads were more than 100 feet greater than the measured heads (see attached Table I). Also, it is not clear which of these wells are coal wells, overburden wells, or underburden wells.

Although the text acknowledges that the modeled heads are "considerably higher" than the measured heads, no potential reason for the difference is provided. When model results are consistently greater (or less) than measured results to such a degree, it is generally considered an indication that there is a problem with the conceptualization or with the input values. Such

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differences could be due to a variety of items or their combination, such as too much model recharge, such as from precipitation, or not enough model discharge, such as through springs.

LQD realizes the difficulty of modeling a large area with sparse data; however, considering the potential magnitude of adverse impacts, the effort to collect the supporting data should proceed at the same level of effort as the evaluation of impacts. Similarly, the level of calibration effort, in particular sensitivity analyses, should be increased. It is not clear from the discussion of the sensitivity analyses on Page 5-6 what parameters were changed in what combination. However, LQD does not believe that the appropriate 'mix' has been achieved considering the exceptional differences in measured and observed heads. Therefore, the model could significantly under (or over) predict the impacts of CBM development on water quantities in the Powder River Basin.

2.2.2 Transient Calibration (Page 5-6 & Figures 5-5, 5-6, & 5-7): LQD's concerns about the transient calibration are similar to those for the steady state calibration. For example, the data evaluation on Figure 5-5 indicates that there have been drawdowns of up to 160 feet in Township 52N, R72W. In contrast, the model results on Figure 5-7 indicate drawdowns of less than 100 feet. Similarly, in Township 51N, R72W, the data evaluation on Figure 5-7 indicates drawdowns of up to 160 feet, while the model results on Figure 5-7 do not indicate drawdowns greater than 125 feet. Further to the south (Area 2, Figure 5-6), the 'center' of the largest measured drawdowns appear to the west of Highway 59, although the 'center' of the largest model drawdowns are to the east of the highway. Therefore, the measured drawdowns either consistently exceed the predicted drawdowns or are at different locations.

2.2.3 Ground Water Recovery. (Section 6.4, Page 6-9): The same text is reproduced on Page 4-43 of the Draft EIS. Therefore, it is not clear if the model runs were extended beyond the cessation of pumping for CBM production. Reference is made to Figures 5-9 and 5-10, which are graphs of water levels versus time for two wells, and these graphs extend almost 200 years. However, no reference is made to: the model time steps; whether all the methane wells were shut down at once; and similar factors that would indicate whether the model was extended past the actual CBM development. On Page 5-6, the text notes lower permeability to water of the coal if high amounts of "adsorbed methane" are present in the coal. It should be clarified if the model was used to simulate recovery after CBM development and whether the effects of permeability changes due to changes in gas pressure and other factors that could display hysteresis, thereby impacting recovery rates, were taken into account.

Table 1
LQD Comparison of Actual and Modeled Ground Water Elevations
from Figure 5-1 of the Ground Water Technical Document supporting the Wyodak Draft EIS
July 1999

Well No.	Actual Head (ft)	Modeled Head (ft)	Difference (Modeled Head - Actual Head)
7-11-46 (OW-13)	3801.84	3779.31	-22.53
15-6-36 (OW-14)	3671.92	3716.10	44.18
USGS OW-1	3694.00	3854.38	160.38
Mall (OW-2)	3702.98	3864.20	161.22
SH-2 (OW-4)	3891.99	3926.61	34.62
WL-12 (OW-5)	4045.00	4004.28	-40.72
Bahms (OW-6)	4024.00	4024.65	0.65
GH-6 (OW-10)	4268.04	4406.87	138.83
Federal 13-2	4283.25	4313.83	30.58
Hwy (OW-18)	4466.00	4637.88	171.88
OW-20	4387.14	4560.92	173.78
WCH-6	4465.88	4649.43	183.55
WRRI-10A (OW-21)	4457.82	4668.85	211.03
Redtop1	4458.00	4684.34	226.34
MC-2-1-P	4491.47	4598.21	106.74
Shagle Federal #2	4649.44	4622.71	-26.73
USGS OW-9	4611.97	4751.92	139.95
CCB-17	4586.38	4841.58	255.2
CDL TR-12 (OW-24)	4616.14	4855.49	239.35
BTR-28	4608.27	4875.35	267.08
BCH-8	4596.46	4819.85	223.39
TCBB-1 (OW-27)	4655.51	4831.91	176.4
NA-38A	4594.59	4792.93	198.34
SOW-109	4580.67	4784.84	204.17

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(42)

BUREAU OF LAND MANAGEMENT
16 [illegible]
BUFFALO FIELD OFFICE
BUFFALO WY

7-13-99

Barlow Livestock
91 Barlow Road
Gillette WY 82718

Dear Sir;

I would like to comment on the Wyodak Coal Bed Methane EIS. My opinion is the study didn't use realistic estimates for the number of wells to be drilled and the volume of water produced from these wells. Devon Energy has wells staked on our property and I am using their numbers. They have as many as 16 wells per section and they estimate 58 gallons per minute of water being produced. This is way more than the EIS estimates. To make the EIS valid I feel the estimates should be raised.

Sincerely
Glenn J. Barlow

From: [illegible]
To: [illegible]
cc:

While You Were Out
Contact:
[illegible]

of:
[illegible]

Phone: FAX:

☒ Telephoned ☐ Will Return
☐ Please Call ☐ Left Package
☐ Will Call Again ☐ Please See Me
☐ Returned Call ☐ Urgent
☐ Was In

Message:
[illegible]

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BUREAU OF LAND MANAGEMENT

[illegible]

Dear Mr. [illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Conservation Staff

Fish Species in: LITTLE POWDER RIVER

[illegible]	LITTLE POWDER RIVER	[illegible] MONTANA
71	[illegible]	24

[illegible]

[illegible]

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Fish Species in: POWDER RIVER (MT SL-SCL)

[illegible] | POWDER RIVER (MT SL-SCL) | [illegible] MONTANA (SEC 1)

[illegible] | [illegible] | [illegible] | [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Fish Species in: POWDER RIVER (SCL-CLR CR)

[illegible] | POWDER RIVER (SCL-CLR CR) | [illegible] MONTANA (SEC 2)

[illegible] | [illegible] | [illegible] |

[illegible]	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

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Fish Species in: POWDER RIVER (CLR CR-JCL)

[illegible]

Fish Species in: POWDER RIVER (JCL-FORKS)

[illegible]

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Fish Species in: POWDER R, NORTH FK(2MAY0)

[illegible]

Fish Species in: POWDER R, NORTH FK(2CANY)

[illegible]

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Fish Species in: POWDER R, NORTH FK(2DULL)

[illegible] | POWDER R, NORTH FK(2DULL) | POWDER RIVER (SEC 3)

[illegible]

Fish Species in: POWDER R, NORTH FK (HEAD)

[illegible] | POWDER R, NORTH FK (HEAD) | POWDER RIVER (SEC 4)

[illegible] 47 | 21 [illegible]

[illegible]

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Fish Species in: POWDER, MID FK(2 BEAV CR)

[illegible] [illegible]	[illegible] POWDER, MID FK(2 BEAV CR)	[illegible] POWDER RIVER (SEC 1)

91	40	16	NE

[illegible]	[illegible]
[illegible]	Brown Trout
[illegible]	[illegible]
[illegible]	Rainbow Trout
STC	[illegible]
[illegible]	White Sucker
[illegible]	Longnose Sucker
[illegible]	Flathead Chub
[illegible]	Longnose Dace

Comments of Biodiversity Association. Data from Wyoming Game and Fish Dept.

Fish Species in: POWDER, MID FK(BEAV-CANY)

[illegible] [illegible]	[illegible] POWDER, MID FK(BEAV-CANY)	[illegible] POWDER RIVER (SEC 2)

[illegible]	40	[illegible]	[illegible]

[illegible]	[illegible]
[illegible]	Rainbow Trout
[illegible]	Brown Trout
[illegible]	White Sucker
[illegible]	Longnose Sucker
[illegible]	[illegible]
[illegible]	Longnose Dace

Comments of Biodiversity Association. Data from Wyoming Game and Fish Dept.

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Fish Species In: POWDER, MID FK(2 WASH CL)

[illegible]	POWDER, MID FK(2 WASH CL)	POWDER RIVER (SEC 3)

[illegible]	42	14	[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Fish Species In: POWDER, MID FK(WASH-H RD)

[illegible]	POWDER, MID FK(WASH-H RD)	POWDER RIVER (SEC 4)

[illegible]	42	[illegible]	[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

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Fish Species In: POWDER, MID FK(HAZEL-TOP)

[illegible]
POWDER, MID FK(HAZEL-TOP)
POWDER RIVER (SEC 8)
[illegible] 42 20

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Courtesy of Biodiversity Associates. Data from Wyoming Game and Fish Dept.

Fish Species In: POWDER, SOUTH FK RED FK

[illegible]
POWDER, SOUTH FK RED FK
RED FORK POWDER RIVER
[illegible] 44 20 [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Courtesy of Biodiversity Associates. Data from Wyoming Game and Fish Dept.

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Fish Species in: POWDER, NORTH FK RED FK

[illegible]	POWDER, NORTH FK RED FK	RED FORK POWDER RIVER

[illegible]	44	[illegible]	[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

Fish Species in: POWDER RIVER, DRY FORK

[illegible]	POWDER RIVER, DRY FORK	POWDER RIVER

[illegible]	44	[illegible]	[illegible]

[illegible]

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Fish Species in: POWDER RIVER, SOUTH FORK

[illegible] POWDER RIVER, SOUTH FORK

POWDER RIVER

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Fish Species in: POWDER RIVER, SOUTH FORK

[illegible] POWDER RIVER, SOUTH FORK

POWDER RIVER

01 41 30

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WYOMING
OUTDOOR
COUNCIL

[illegible]
[illegible]

BUREAU OF LAND MANAGEMENT
16 199
BUFFALO FIELD OFFICE
BUFFALO WY

By FAX to (307) 684-1122 and U.S. Mail

July 14, 1999

Richard Zander
Buffalo Field Office
Bureau of Land Management
1425 Fort Street
Buffalo, WY 82834

Re: Wyodak Coal Bed Methane Project DEIS

Dear Mr. Zander:

The Wyoming Outdoor Council (WOC) has serious concerns about the potential direct, cumulative and long-term environmental effects likely to result from the Wyodak Coal Bed Methane Project, and the absence of meaningful disclosure of environmental effects in the document. It is obvious BLM has failed to take the "hard look" at impacts as required by NEPA.

GENERAL OBSERVATIONS CONCERNING DISCLOSURE OF EFFECTS.

The BLM defers most of the analysis to the subsequent site-specific well-permitting (APD) stage, undermining the usefulness of this project-level analysis. Throughout the document, reference is made to future analyses that may be performed and future unspecified mitigation that may be implemented. The deferral and, in many cases complete absence, of analysis negates the purpose of NEPA, which requires that impact analyses and associated alternatives, as well as mitigation, be presented to the public for review and comment in an EIS.

The EIS fails to identify which impacts may be significant, and fails to establish objective criteria upon which to base "significance" findings.

The EIS fails to identify and evaluate impacts that may be present after the project's completion. (Table 2-2 simply defines "long-term" disturbance as "disturbance continuing during the life of the project.")

The EIS fails to acknowledge that CBM development in the Powder River Basin is likely to continue in areas outside the project area, with the number of wells estimated by industry sources as high as 14,000 to 20,000. NEPA requires an analysis of the cumulative effects of reasonably foreseeable future actions, such as the future expansion of coal bed methane and coal mining in the basin.

The DEIS is severely deficient in its discussion of specific mitigation measures that could be implemented to reduce or avoid environmental impacts.

PROPOSED ACTION

Water Management Plan. The EIS states (at 1-13) that water management plans will be required as part of the APD approval process. According to the EIS (at 2-14), "these plans will address how large volumes of produced water would be managed on a drainage-by-drainage basis." Given that the management of produced water is one of the most significant issues associated with this project, and since these water management plans will describe potential impacts of the proposed action and mitigation options, they should be included in the EIS so they are available for review and comment by agencies and the public. We recommend that detailed and specific water management plans be developed for each of the major drainages in the analysis area. Among other things, the Plan should identify areas off-limits to disposal of produced water such as closed basins and playas; identify suitable disposal sites, including shallow and deep aquifers, and include a mitigation and monitoring plan containing specific elements.

Production Pods (DEIS at 2-10). The EIS should identify suitable locations for the siting of production pods. Since activity will be concentrated at and near these pods, it is important that pods be sited to avoid sensitive surface resources (e.g., wetlands, erosive soils, crucial wildlife habitat) and potential conflicts with other uses.

Well Production Facilities. The EIS claims (at 2-11) that wellhead facilities will be installed on a leveled site measuring "perhaps five or six square feet." Since this area is less that half the size of my small desk at work, I find this statement incredible.

Pipelines. It is obvious that the project area will be heavily criss-crossed with all manner of surface and buried pipelines. Please explain how BLM will mitigate the effects when surface erosion in gullies and drainages exposes pipe crossing these features.

Produced Water Gathering System and Discharge Facilities. The EIS bases the analysis of impacts on an average flow rate of 12 gallons per minute (gpm). DEIS at 2-12. Yet many CBM wells in the project area discharge at much higher rates.

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-Table 2-1 indicates that there could be as many 1,[illegible] water discharge points in the project area. The EIS should identify proposed (and alternative) discharge sites, and describe the impacts and mitigation opportunities associated with each location. The EIS reports (at 4-12) that "approximately 2,[illegible] discharge points will be utilized to implement the Proposed Action." Please explain this significant discrepancy.

Gas Delivery System. The EIS states (at 2-14) that existing pipeline capacity is not adequate to accommodate the volume of gas that ultimately will be produced in the project area. This implies that additional capacity will be provided. In fact, the EIS (Table 2-1) shows the total pipeline capacity in the project area increasing to over 1 billion cfd (1,000 MMCFD). This capacity would be achieved by the proposed Thunder Creek Pipeline (TCP), running north-south in the western part of the project area, and the proposed Fort Union Gas Gathering pipeline, also in the western half of the project area. This EIS must analyze the impacts of connected and cumulative actions such as these and other high pressure pipelines that will be constructed to gather and ship CBM gas to market.

Compression. The EIS estimates that the proposed action and the two alternatives displayed in the EIS will require the addition of approximately: 147 booster compressors; 34 field compressor stations; and 5 pipeline compressors. See Table 2-1.

-Table 2-1 shows a total of [illegible] booster compressors, but the text indicates that "the proposed action will require approximately [illegible] additional booster compressors." DEIS at 2-14. Please explain the discrepancy between the two the figures.

-Because activity (and impacts) will be concentrated at and near these facilities, it is important that compressors and compressor stations be sited to avoid sensitive surface resources and potential conflicts with other uses.

-Although the number of wells varies considerably between alternatives, the EIS states (table 2-1, footnote) compression demand is not expected to vary. Please explain why.

Power Generation. To reduce impacts to air quality related values in sensitive areas, emissions of atmospheric pollutants (including hazardous air pollutants such as formaldehyde), and [illegible] impacts from overhead transmission lines, the EIS should consider alternative power options, such as hydrogen fuel cells. We have included for your reference an article from the June [illegible], 1999 Wall Street Journal describing the use of hydrogen fuel cells in subdivision construction.

Road Access. The EIS should include a transportation plan showing preferred corridors and alternatives that minimize environmental impacts and resource

conflicts. Major access roads and utility corridors serving the project area should be identified and selected to result in the least possible impact.

Well Spacing. The EIS bases its analysis on a 40 acre spacing. How likely is it that well density may have to be increased in the future to ensure maximum ultimate recovery of the CBM resource? Is 20-acre spacing being implemented in any of the PRB's CBM fields?

Hydrologic Monitoring and Mitigation. The EIS states that mitigation would be achieved under state law if private landowners fail to accept the Water Well Agreement. It should be acknowledged that State law provides little in the way of mitigation for the kinds of impacts most likely to occur as a result of aquifer de-watering: reductions of [illegible] of domestic and stock wells and contamination of wells by methane gas. Since it is likely that a CBM well will be the lowest point of diversion, the loss of a shallower stock well or domestic well would not be compensable under state law. In addition, state water law doesn't address the problem of methane contaminating domestic water supplies.

Powder River Area Groundwater Monitoring Organization. Information and data collected by PRAGMO should be made available in public libraries and DEQ offices in Gillette and Sheridan, and made available on the World Wide Web.

ALTERNATIVES.

This section is the "heart" of the EIS. 40 CFR § 1502.14. Based on the information and analyses in the environmental consequences section and the description of affected environment, the alternatives section "should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis of choice among options by the decisionmaker and the public." Among other things, the agency must in this section "rigorously explore and objectively evaluate all reasonable alternatives..." The comparison of alternatives and impacts associated with each should be based on a discussion of "conservation potential of various alternatives and mitigation measures." 40 CFR § 1502.16(e).

Staged Development Alternative. As many other reviewers have observed, the range of alternatives and analysis of impacts described in this EIS are inadequate. To address the concerns raised by the public dealing with the uncertainty of impacts and effectiveness of mitigation, we suggest the development of an alternative that would authorize development in stages, the authorization of which would depend on successful completion of earlier stages. Data and information collected in earlier stages could be applied to subsequent stages to ensure that impacts are acceptable and within projected ranges and mitigation measures are appropriate and effective. Each subsequent stage would include and benefit from mitigation and operational

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conditions developed and implemented in earlier stages. By proceeding in discreet stages, it is hoped that BLM would be able to provide answers to some of the significant questions raised during scoping, such as capacity of and impacts to surface drainages used to dispose of produced water, hazards and environmental impacts from coal bed methane venting, water quality impacts, aquifer recharge rates and impacts, effectiveness of mitigation, etc.

Disposal of Produced Water. The management, use, disposal of and impacts from produced water are perhaps the greatest challenges faced by the BLM in connection with this project. Thus we are amazed and shocked that so little consideration is given to examining alternatives to address these issues. The EIS rejects as infeasible the option of disposing of produced water by injection well. The reason this particular alternative is rejected is unclear. The EIS should try to clarify the discussion on "usable" aquifers. Are you saying regulatory requirements of the underground injection control (UIC) program preclude this activity, or that there are no suitable aquifers available into which the water could be re-injected? Rather than dismissing the disposal well option outright (i.e., on a project-wide basis), the EIS should evaluate whether it would be appropriate in some areas in the project area, for example where impacts from surface discharge would be unacceptable. For example, it is not at all clear why produced water can't be injected into the Wasatch Sand Aquifer, particularly when recharge from surface disposal is anticipated. DEIS at 4-43.

It is clear from reading the supposed rationale for rejected the alternative (DEIS at 2-29), the BLM simply doesn't want to deal with this issue. First, while it may be true that disposal by injection would require additional wells and pipelines (resulting in additional surface disturbance), perhaps the additional surface impact is justified to the extent it would mitigate surface water impacts and other conflicts that undoubtedly will arise from discharging massive amounts of produced water into intermittent and ephemeral drainages. And although the produced water will be available for "subsequent beneficial uses," BLM hasn't identified (and can't know) whether these uses will in fact occur. Most likely, some of the water will be put to beneficial use, but a greater amount will simply wash downstream and out of Wyoming, carrying with it hundreds of thousands of tons of sediments, and causing massive erosion and disturbance in the process.

The EIS must be revised to include a detailed and thoughtful examination of options for the management, use and disposal of produced water, taking into account the relative costs and benefits of each, including environmental as well as economic. Such alternatives include, but are not limited to, re-injecting into aquifers (other than the coal seam, as described), shipping it by pipeline to the North Platte River to mitigate impacts to threatened and endangered species in Nebraska, storing it in or near the project area, or using it to recharge the Ogalala aquifer, which has suffered extensive dewatering.

No Action. The EIS must include a true "no action" alternative. One of the primary purposes of the no action alternative under NEPA is to establish a "baseline for analysis, upon which impacts from action alternatives may be measured. The EIS improperly includes in the no action scenario coal bed methane development on private land/mineral estate.

ENVIRONMENTAL CONSEQUENCES

Air Quality

Section 169A of the Clean Air Act (CAA) establishes as a national goal the "prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class 1 federal areas..." Federal land managers have under this section an "affirmative responsibility" to protect Class I areas.

Section 102 of the Federal Land Policy and Management Act (FLPMA), mandates the BLM to manage the public lands "in a manner that will protect … air and atmospheric … values." 43 U.S.C. § 1701(a)(8).

FLPMA Section 202(c)(8) requires that BLM's management actions "provide for compliance with applicable pollution control laws, including state and federal air, water, noise, or other pollution standards or implementation plans." 43 USC 1712.

Despite these clear statutory directives, the DEIS (at 4-149) projects significant cumulative impacts to air quality related values in sensitive Class I and II receptors in Wyoming, Montana and South Dakota. As required by the regulations implementing NEPA, 40 CFR § 1502.16(c), please explain how the proposed actions are consistent with each of these statutory requirements.

At Wind Cave National Park, the DEIS estimates that visibility impairment (>0.5 deciview, a 5% reduction) will occur 138 days per year; at Badlands National Park the DEIS estimates that visibility impairment will be perceptible 116 days per year. In the Big Horn National Forest's Cloud Peak Wilderness, visibility will be reduced by 5 % or more 63 days per year, while impairment at Devils Tower National Monument is estimated 121 days per year. Visibility impairment in excess of 0.5 deciview will occur an estimated 134 days on the Northern Cheyenne Reservation, a Class I area.

This level of significant impairment is unacceptable and contrary to the requirements of the CAA, as well as Wyoming's plan for the protection of visibility in Class I areas (visibility SIP), set out in the state's and Tribe's air quality regulations. The proposed action is likely also contrary to the requirements of visibility SIPs for South Dakota, Montana, and the Northern Cheyenne Reservation. BLM should consult with the

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appropriate air quality divisions to learn precisely what the requirements are in this regard, and report the findings from that coordination in the EIS.

Wyoming's visibility SIP requires the state to achieve reasonable progress toward achieving the national visibility goal. The BLM is prohibited under the authorities cited above from issuing any decision that would result in impairment to these sensitive areas and thwart reasonable progress toward the goals. Please explain how BLM intends to comply with Wyoming's visibility SIP, and the SIPs of Montana, South Dakota and the Northern Cheyenne Reservation.

Cultural Resources. We don't see any evidence that proper consultation with Native Americans took place. Providing a copy of the EIS to Tribal representatives (DEIS at 3-48) hardly begins to fulfill your statutory responsibilities. Please list in the EIS the specific steps that were taken to solicit the input of the Tribes.

Methane Venting, Fire Hazard and Spontaneous Combustion.

Venting. The EIS states (at 3-3) that "[m]ethane migration potentially could occur at widespread locations within the Powder River Basin, as methane can migrate long distances along naturally-occurring joints or fractures in rocks." It is axiomatic that de-watering the coal bed will only increase the likelihood that venting will occur. That is, after all, the purpose of de-watering. As the EIS notes, "Reducing the hydrostatic pressure on the coal seam by pumping off the water enhances the release and production of methane previously trapped in the coal matrix as well as dissolved in the water." DEIS at 3-4.

In Chapter 4, the environmental consequences section of the EIS, it is noted that:

> "Methane migration potentially could occur over short or long distances within the PRB, along naturally-occurring joints and fractures. Methane could seep from water wells near CBM production areas, affecting water wells, residences or coal mine facilities. * * * If methane seeps occurred, vegetation surrounding a seep likely would be killed or stressed, unless resistant to the local conditions near the seep. Soil productivity likely would be decreased."

DEIS at 4-2. Despite acknowledging this serious threat, the EIS provides no analysis or discussion of ways to control or mitigate the effects of CBM migration and venting, other than by placing conditions of approval on individual APDs. And although the EIS suggests that methane venting could be controlled through conditions of approval placed on APDs – this method will not address venting or seepage through water wells or natural pathways (fissures, joints, fractures or indeed, springs) present in the rock.

Fires and Spontaneous Combustion.

The EIS provides that "when water levels drop in unconfined coal aquifers, oxidation increases and the self-heating of coal accelerates until combustion occurs." DEIS at 3-5. It goes on to say that range fires and spontaneous combustion have in fact ignited areas of exposed coal. DEIS 4-18. We are concerned that underground coal may, through de-watering, become oxidized and susceptible to spontaneous combustion. This issue is not discussed in the EIS. For example, besides the obvious question of how to extinguish the fire, what would the long-term effect be on the coal seam aquifer's ability to continue to function as an aquifer after being burned? Wouldn't the damage to the aquifer be irreparable?

The EIS should discuss mitigation measures that may be available to reduce or eliminate this very serious threat, and opportunities and procedures available to compensate landowners and others for losses caused by fire (including the potential loss of the coal aquifer). Moreover, because of its importance, the EIS should endeavor to answer the question BLM acknowledges remains unresolved: "Whether methane seepage could accelerate the natural process of coal combustion at the outcrop ...." DEIS at 3-6. The EIS should also evaluate, as mentioned above, the potential for oxidation and combustion of underground coal seams.

Impacts to Wells. As described in the EIS, impacts from the venting or seepage of methane include increased fire danger and risk of explosion, and contamination of well water. The EIS (at 4-108) states:

> "Impacts to water wells in the vicinity of CBM develop-ment may occur. These wells may experience lowered yields, a loss of productivity, or seepage of methane, creating potentially explosive conditions. Adequate ventilation of well coverings would reduce the risk of methane becoming concentrated in these enclosed areas."

Because residences and ranch dwellings are scattered throughout the project area and could be affected by methane venting, the EIS should identify specific mitigation to minimize the kinds of impact described above. It is unacceptable for BLM to wait until subdivisions near Gillette are threatened (DEIS at 4-108) before developing appropriate mitigation. It is also inappropriate for BLM to rely on the water well agreement, a private arrangement between a CBM operator and owner of an affected water well, to satisfy the agency's mitigation responsibilities. Because it leased the mineral properties and because it authorizes the drilling on federal land and minerals, the BLM shares a significant responsibility for the consequences of this CBM development project. The BLM should consider what *it* can do to minimize the adverse effects from CBM development, rather than assigning this responsibility to the operator.

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Industrial Conversion. The EIS fails to describe how the project –including roads, pipelines, production facilities, compressors, overhead utility lines, utility poles, etc., - will significantly alter the existing landscape, and the "sense of place" that long-time residents of the PRB have developed. Having witnessed first hand this type of industrial conversion take place in southwest Wyoming, it is essential that the EIS document this effect.

Geology and Mineral Resources. The EIS (at 4-131) concludes that "CBM development would have little effect on topography." This conclusion is not supported by the analysis of impacts which suggests that many drainages and draws used for the disposal of produced water could become deeply incised; ravines and gullies are likely to develop. DEIS at 4-9. The EIS also indicates that stream morphology could change significantly as a result of significantly increased flows in ephemeral, intermittent and perennial streams. See, e. g., DEIS at 3-16, 4-9.

Land Use, Social and Economic Impacts. The EIS fails to explain how disruptions to ranching operations and disruptive changes in land use are to be mitigated. For example, will the BLM or operators compensate private individuals for the loss of a second hay cutting, dealing with hazards such as CBM venting, range fires and flooding, necessary fence construction, removal of sediments from reservoirs, or post-project erosion control (DEIS at 4-13)? The list goes on and on. Who pays? BLM or the operators?

Liability for negligent action. TheyEIS acknowledges that the project may cause flooding, disruption of land uses, fire hazards, CBM venting, erosion of stream channels, and a host of other impacts. Has the BLM considered its potential liability under the civil law for causing or contributing to the loss of property and diminution of property values that may occur as a result of this project, such as flooding, fire, explosions, etc?

Noise Impacts. Compressors should be located at least 1/2 mile from sage grouse leks. And sage grouse leks should be identified as a "sensitive receptor" (DEIS at 4-114).

-Compressors and other sources of noise and human disturbance (e.g., production pods) should be placed away from the Fortification Creek WSA.

Produced Water. Without offering any specifics, the EIS (at 4-11, 4-88) suggests that the water produced from the project will be put to beneficial use, for irrigation, stock watering, ponds and reservoirs, and other uses. We have serious doubts about these claims. Wyoming statutes require that the producer of water put it to beneficial use; references to and reliance on unknown third parties and statements about speculative beneficial uses that may be made of the water fails to comply with Wyoming's water law. The EIS should explain how the discharge of produced water by an operator of a CBM well constitutes "beneficial use" under Wyoming's water law. NEPA regulations (40 CFR § 1502.16(c)) require you to address this potential conflict.

Reclamation, Soils and Vegetation.

Soils. The EIS (at 4-80) anticipates that soil loss in the short term "would exceed acceptable levels for 9 of the 15 dominant soil series." This level of disturbance should be identified as a significant impact.

Soils. The EIS goes on (4-80) to identify the need for best management practices, but fails to identify or discuss what measures may be effective at controlling short-term soil loss.

Reclamation, 4-80. The EIS should explain and describe the "effective reclamation practices" it asserts will effectively mitigate impacts to soils and vegetation.

Reclamation, 4-80. The EIS should require the use of native seed mixes, and set out clear reclamation requirements and objectives, for the short as well as long term (beyond simply stating that a "natural appearance" is desired). These requirements should include' 1) contemporaneous reclamation; 2) returning the topography to approximate original contour –including, especially, drainages and roads that have been altered or damaged by erosion; 3) establishing the natural vegetative diversity that existed pre-disturbance; 4) continuous reclamation responsibilities until reclamation is achieved; 5) measurable reclamation requirements, such as soil stabilization within 3 months and natural vegetative diversity within 5 years.

Reclamation. Does BLM intend to keep livestock off reclaimed areas until plants and grasses have had an opportunity to re-establish?

Soils, 4-81. The Record of Decision should prohibit the discharge of produced water in playas, closed basins and soils with low reclamation potential to prevent the accumulation of salts in soils. Doing so would lessen the likelihood for invasion of weedy species, and erosion of bare soils.

Soils and Vegetation, 4-79 to 4-84. The EIS fails to identify and evaluate the impact of wind erosion on bare soils, particularly those with high concentrations of salt which make re-vegetation difficult.

Soils and Vegetation, 4-83. The EIS should identify the reduction of "long-term vegetation productivity of disturbed areas and areas adjacent" as a significant impact.

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Soils. DEIS at 4-60, 61. The EIS should identify and discuss the effective reclamation practices, mitigation

Soils. DEIS at 4-133. The EIS must describe the best management practices (BMP) it proposes to implement, and evaluate, as part of this analysis, the effectiveness of achieving the stated goals, such as "control erosion" and "limit soil loss."

Water Quality

The EIS should indicate existing and proposed water quality standards for each surface water proposed as a receiver for produced water. The EIS should note that 1) Wyoming is in the process of revising its water quality standards (Water Quality Rules Chapter 1), and 2) that many existing classifications are incorrect and illegal because they fail to protect existing and attainable uses and provide basic aquatic life protections. For example, all waters in the PRB presently designated Class 4 do not contain the appropriate and legally required aquatic life criteria. All such waters must be protected at a minimum for aquatic life unless/until a use attainability analysis (approved by DEQ and EPA after a public hearing) demonstrates the use is not attainable.

The EIS should be revised to note that under EPA water quality regulations at 40 CFR Parts 130 and 131, point source discharges are not authorized into "water quality limited segments" identified on the state's section 303(d) list.

The EIS should no that Wyoming DEQ has issued a general section 402 permit for the discharge of produced water.

Increased surface waters, surface flows, and availability of water year-round will NOT "improve the health of the biological components of ecosystems within the project area during the life of the project." DEIS at 4-11. Increased surface flows, etc., will ALTER the health of the biological components of ecosystems. Given the significant impacts to water quality and stream morphology expected from this project (flooding, erosion, sediments, etc) how can you possibly support this assertion? Please make the appropriate changes in the EIS.

Similarly, riparian habitats will NOT be "improved" by increased surface waters and flows, nor will wildlife habitats. They will simply be altered. DEIS at 4-12.

Seeps and Springs. The EIS (at 3-2) states that "[u]nderground coal seams are important aquifers in many parts of the study area, feeding springs and seeps." How is the EIS able to conclude that impacts to springs will be insignificant or unknown when the aquifers that supplies water to these features will be directly and adversely affected?

Surface flows. Referencing flows solely at the project boundary (Table 4-1) suggest that flows inside the project area are unimportant. The EIS should indicate projected flows (average and maximum) at the point of discharge in all surface waters.

Water Quality Standards. In certain instances, flow alteration caused by the discharge of large volumes of produced water may violate Wyoming surface water criteria for the protection of aquatic life. A violation will occur even where chemical analysis of the discharged water show no exceedances of applicable parameters.

-The discharge of produced water and consequent sedimentation and turbidity caused by erosion (see DEIS at 3-16, 4-4 to 4-11, 4-132 to 4-134) will likely violate Wyoming's water quality criteria for turbidity.

Groundwater. The EIS must evaluate whether the de-watering (and potential spontaneous combustion) of the Wyodak/Fort Union Formations will cause irreversible damage to the formations' ability to act as an aquifer after the cessation of project activities.

Wilderness Study Areas

The 13,000 acre Fortification Creek Wilderness Study Area (FCWSA) is situated in the northwest portion of the analysis area. According to the BLM's Statewide Wilderness Study Report, the FCWSA "appears to have been primarily affected by the forces of nature, with little evidence of human imprints. "The natural character of the land has been maintained and preserved because of the area's ruggedness." Wilderness Report at 300. The WSA "offers outstanding opportunities for solitude."

The EIS contains virtually no analysis of the effects of the proposed action and reasonably foreseeable future actions on the Fortification Creek WSA and therefore should be revised to address the potential direct, indirect and cumulative impacts to this area for all parameters: air, water, recreation, wildlife, soils, visual, etc.

Discharges of produced water into drainages that flow into the WSA should be prohibited because of the potential for significant alternation of natural functions and conditions within the area.

Wildlife

General. The EIS (at 4-87) states that the project "could affect up to 16,751 acres of terrestrial wildlife habitat during the life of the project." In fact, the project will affect a much larger area, since this figure is referencing only direct disturbance resulting from construction. This approach to assessing wildlife habitat is inadequate because it discounts indirect and secondary effects caused by human activity in the area. In particular, the statement (at 4-88) that elk are likely to be habituated strains credulity.

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Threatened, Endangered and Sensitive Species.

A number of "special status" terrestrial, aquatic and avian species inhabit the project area, including the swift fox, black-tailed prairie dog, mountain plover, sturgeon chub, bald eagle, black-footed ferret, Ute-ladies tresses, and 27 Forest Service "sensitive species." DEIS at 4-91 to 4-93. Grouse (sage?) also inhabit the project area. DEIS at 4-93. Burrowing owls may inhabit the area, but the EIS gives no consideration to the potential impacts to this species.

The BLM has an obligation to provide for the continued survival of these species, and to understand and disclose the effects of its actions on these species yet proposes to defer the analysis of impacts to the site-specific APD stage: "Potential impacts to these species will be analyzed site-specifically, as needed, during review of APDs or Sundry Notices, and impacts eliminated or minimized through the application of special conditions of approval for drilling or production operations." DEIS at 4-92. NEPA, however, requires the EIS to evaluate the direct, indirect and cumulative impacts of the proposed action and discuss reasonable and specific mitigation measures to minimize any potential effects that cannot be avoided. See 40 CFR § 1502.14(f) and 1502.16(h).

The BLM's decision to defer analysis of the "remaining seventeen FS sensitive species" is totally deficient, failing to meet even the most basic requirements of NEPA as well as the Forest Service's procedures for the assessment of sensitive species.

NEPA regulations at 40 CFR § 1502.25 require BLM to integrate this EIS with other studies and reports required by law, including those required pursuant to the Endangered Species Act. We recommend that the BLM confer and/or consult with the United States Fish and Wildlife Service concerning the potential effects to candidate, proposed and listed species, and make the record of the consultation available in the EIS for public review and comment. Consultation done earlier for other CBM projects (DEIS at 4-169) doesn't satisfy applicable requirements.

Fishes. The EIS (at 4-90, 91) indicates that mitigation for unspecified potentially adverse impacts may be included in site-specific conditions of approval for APDs. As previously stated, examination of impacts and possible mitigation alternatives must be discussed in this EIS, not deferred to the APD stage. Potential sources of harm include but are not limited to increased concentrations of TDS and suspended sediments, destruction of spawning areas and food sources.

The EIS should re-evaluate the potential impacts to all aquatic species (listed on page 3-40) in the project area. Specifically, for all fishes potentially affected by the project, the EIS should document how significantly enhanced flows and water quality degradation (sediments, turbidity, toxics) caused by the project may affect them.

The EIS's conclusion (at 4-90) that "CBM development is not likely to degrade water quality in local streams by increasing sediment loads" is incredible. Soil loss, flooding and erosion are identified as potentially serious problems throughout the project area. Please explain this statement, with reference to supporting materials.

The sturgeon chub is a candidate for listing that inhabits several drainages in (and downstream from) the project area. The EIS's description of the project area (at 3-44) indicates that the "Powder River in Wyoming supports the largest known reproducing population of sturgeon chub[s]" but on page 4-90 concludes that "no habitat for the chub occurs within the project area." Please reconcile this apparent contradiction.

The EIS observes (at 3-44) that "spawning occurs within shallow rapids over gravel and rock" but concludes (at 4-90) that "impacts to the sturgeon chub are not anticipated." This no-impact conclusion is apparently based on the belief that flows in the Powder River would not "significantly increase." Id. How is it, given the absence of water management plans, that BLM is able to conclude that flows in the Powder River would not significantly increase? Where is the data showing this?

MISCELLANEOUS

Bonding. Because of the unique concerns surrounding CBM development, BLM should consider requiring individual (as opposed to nationwide) bonds from each of the operators sufficient to redress any foreseeable harm caused by CBM development and operation authorized by BLM in the Powder River Basin. Bonds should be retained by BLM until reclamation is deemed successful and complete and until the agency is assured potential long-term liabilities have been addressed.

Cumulative effects. Industry sources project that as many as 30,000 CBM wells could be developed in the PRB in the next decade. In addition, coal mining and leasing is expected to continue at present or even accelerated levels. The DEIS should consider the cumulative effects from this expanded level of development, which is not only reasonably foreseeable, but highly likely. See 40 CFR § 1508.7.

Water Well Agreement. The Water Well Agreement should be revised to make clear that CBM operators have an ongoing obligation to compensate well owners for damage or loss to wells for as long as the condition persists, indefinitely if necessary. The proposed agreement (¶ 12) terminates upon the expiration of the last lease or the plugging and abandonment of the last coal bed methane well, whichever is later.

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-The BLM should request an opinion from the DOI's Solicitor on whether the contract is enforceable. WOC is concerned that if push comes to shove, companies could argue that BLM exceeded its authority in requiring operators to enter into such an agreement. Has any court upheld this or similar agreements?

-Assuming the agreement is enforceable, it should be revised to include and extend to individuals who serve as directors, officers and executives in the CBM companies. We are concerned that many of the smaller CBM companies created to exploit the CBM resources in the PRB could, if they chose, terminate their corporate existence (dissolution) and in so doing escape all liability under the water well agreement.

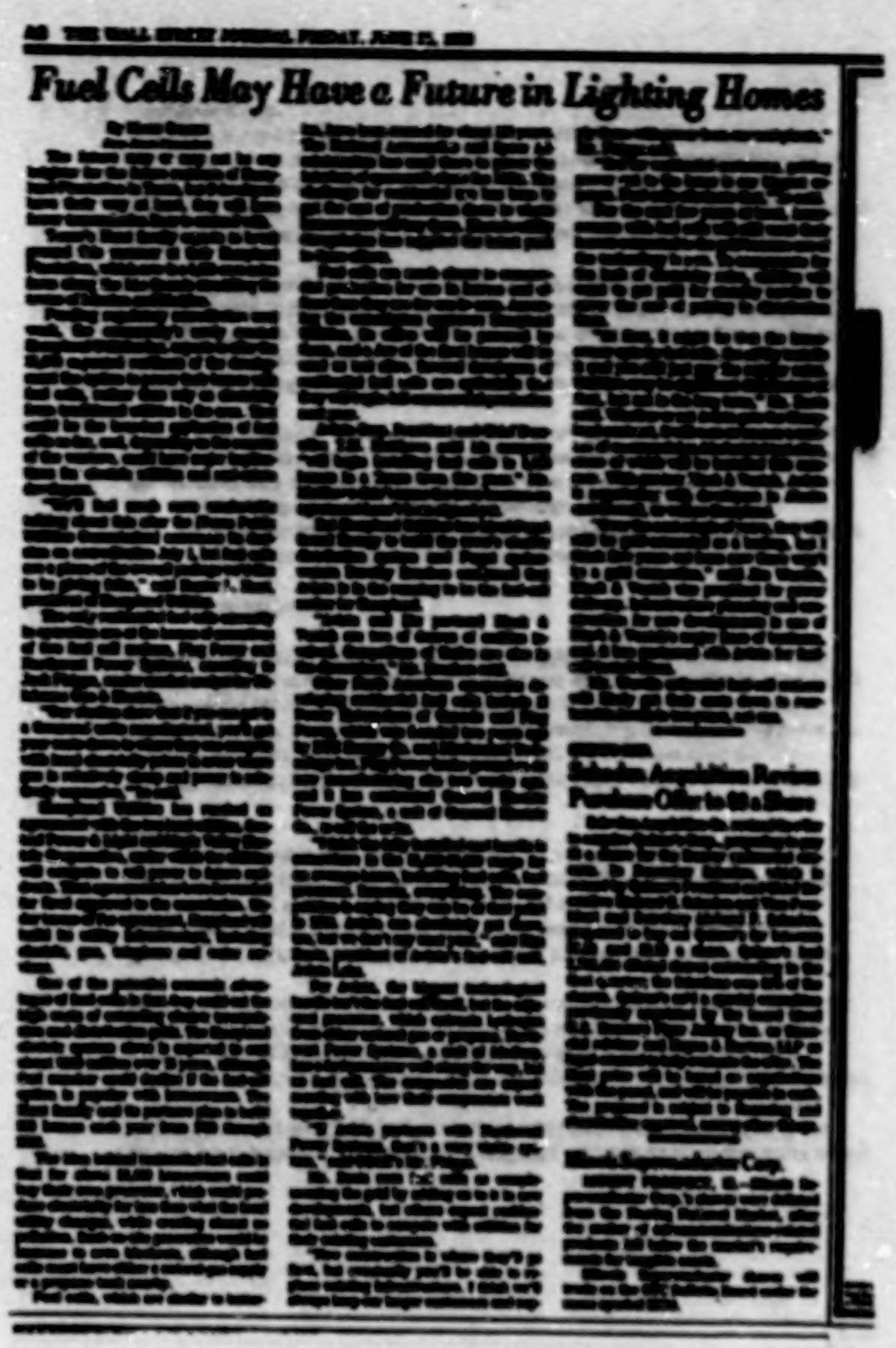
CONCLUSION

The EIS is woefully deficient in analyzing the environmental consequences of the proposed action. It overlooks or deals inadequately with most of the significant issues raised during public scoping. Areas where the analysis is deficient include, but are not limited to: examining alternatives for the management and disposal of produced water; recognizing and mitigating environmental and public health and safety hazards from coal bed methane venting; long term impacts to the coal aquifer and loss of potential to provide this function following cessation of activities; controlling and mitigating range lands fires caused by spontaneous combustion of the coal seams and/or ignition of methane gas; issues associated with aquifer recharge (or lack thereof); and loss of well water and mitigation options. The EIS should be corrected to address in a meaningful way these issues and re-released as a supplemental Draft EIS.

WOC appreciates the opportunity to comment. Please advise us immediately of any additional comment opportunities and the availability of environmental documents related to the development of CBM resources in the Powder River Basin. Thank you.

Sincerely,

Dan Heilig
Executive Director



Fuel Cells May Have a Future in Lighting Homes

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LANCE OIL & GAS COMPANY, INC.
12200 N. Pecos Street • Denver, Colorado 80234
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BUREAU OF LAND MANAGEMENT
JUL 16 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

July 12, 1999

Bureau of Land Management
Mr. Richard Zander
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

RE: Comments on the Wyodak Coal Bed Methane Project Draft Environmental Impact Statement

Dear Mr. Zander,

Lance Oil & Gas Company, Inc. is pleased to submit the following comments regarding the referenced Wyodak Coal Bed Methane Project Draft Environmental Impact Statement.

Comment 1, Page 1-13
The statement is made that "All operations would be required to comply with WDEQ rules regarding noise limits..." At the present time, the WDEQ does not regulate noise limits. Noise abatement measures have been installed by operators in response to land owners, BLM or FERC requests or requirements. The CBM operators have and will comply with rules regarding noise limits.

Comment 2, Table 2-1
Under Item 2, Depth: 330 to 1,200' is cited. Most of the wells drilled to date are in this range. However, there are producing wells at depths of less than 330' and wells are currently planned for 1999 that will be 1,300' to 1,600' completed depth.

Comment 3, Page 2-8
Under Road Access for Drilling Operations the statement is made "In more rugged terrain, BLM experience to date has shown that construction of a rough well access road to the drill location using cut and fill construction techniques may be necessary an estimated ten percent of the time." Because of the portability of the drilling rigs used on this project and their ability to negotiate rough terrain and operate on side slopes, it is Lance's opinion that cut and fill construction will be utilized less than five percent of the time. Cut and fill construction will only be utilized when needed so that damage can be minimized.

Comment 4, Page 2-11
The statement is made "Well site production facilities typically will not be fenced or otherwise removed from existing uses." If livestock will routinely be in and around the facilities, the facilities will be fenced in order to avoid injury to livestock and to eliminate damage to equipment by the livestock.

Comment 5, Page 2-12
The Powder River Area Groundwater Monitoring Organization, PRAGMO, is defined as part of the discussion on groundwater monitoring. How will the CBM operators be required to join this group and what means of enforcement is available to the BLM to ensure that the required data is provided to PRAGMO so that drawdown curves and maps can be generated and provided to the BLM and other participating agencies?

Comment 6, Page 3-13
The paragraph that begins "Over 50 percent..." indicates the concentration of dissolved solids in existing streams and discharges in the Powder River Basin. It should be pointed out that the TDS of the average CBM well is approx. 764 which in most cases is below the existing TDS in the streams and discharges.

Comment 7, Table 3-6
This table details chemical analyses of stream water in the Belle Fourche River. Please observe that the iron and manganese content of existing surface water and ground water cannot meet the WDEQ/WQD's proposed maximum limits on CBM discharges and this existing water source is far greater in quantity than the maximum discharge volumes. Is the BLM planning to ensure that all discharges from Federal lands will be in compliance with state regulations?

Comment 8, Page 3-22
In the paragraph beginning "Solute concentrations..." A statement is made that average concentrations of TDS are 1,000 to 2,000 mg/l from the Fort Union Formation. In the following paragraph the statement is made that "Produced water contains an average (mean value) of 764 mg/l Total Dissolved Solids". Why is their such a large discrepancy between the published USGS, 1974 data and actual data from 577 CBM discharge samples?

Comment 9, Table 3-9
The median values of metal concentration in the existing groundwater are higher than the upper limits being proposed for CBM discharge. This is the same comment as for Comment 7.

Comment 10, Page 4-1
The statement on Peak gas production may be misleading. The Peak gas production from 3,000 proposed wells will be in excess of 375 million cubic feet per day. The average production from 3,000 wells utilizing 125 thousand cubic feet per day per well will be 375 million cubic feet per day.

Comment 11, Page 4-2
The statement is made that "CBM wells in the PRB are projected to be a minimum of 330 feet deep." Please note, that there are some wells on the East side of the development that are completed at depths less than 330'. However, most of the wells planned in the EIS area are

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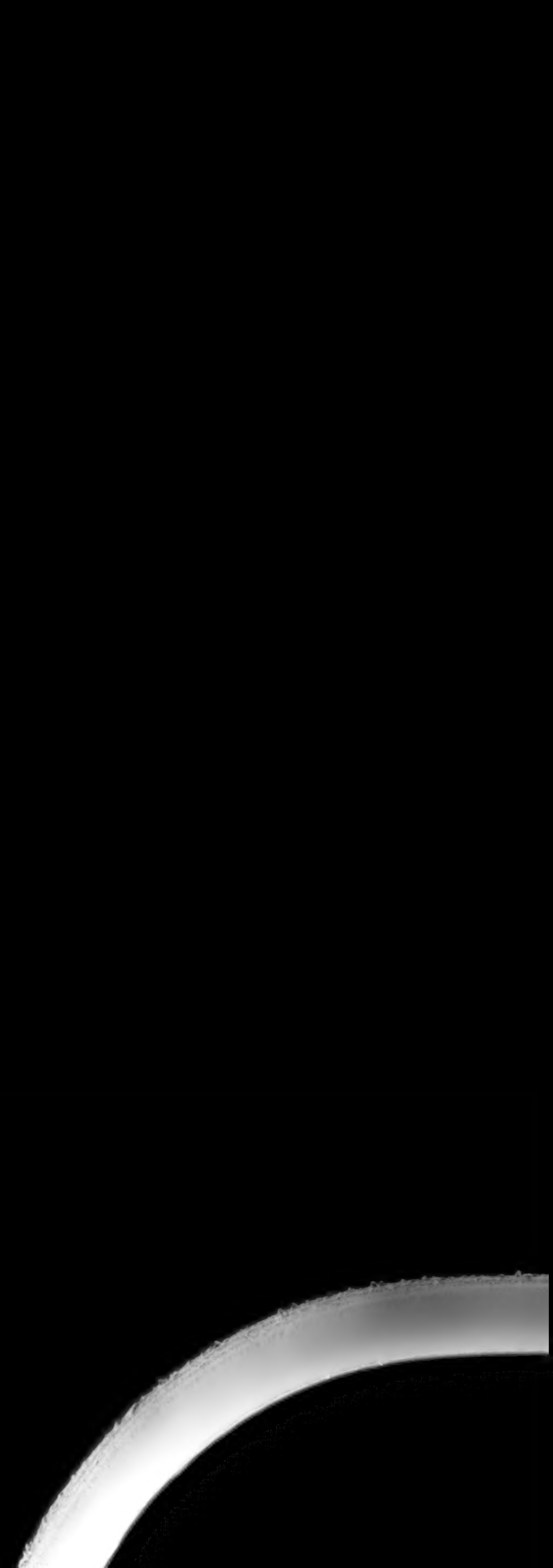

proposed to depths greater than 350'.

Comment 12, Page 4-5
The statement is made that "A CBM generated flow of 0.22 cfs would substantially exceed the typical 2-year, 24-hour storm flow from one square mile, due to the aridity of the region." No data is presented in the EIS as to the amount of run-off generated in a typical 2-year, 24 hour storm. However, observations of drainages during and following the spring storm in April of this year indicated at least a ten fold increase in water volumes. The rain volume runoff far surpassed the CBM volume. Also, in Table 3-2 Maximum Flow in cfs is presented. The per square mile run-off generated at the maximum given in the table ranges from 2.14 cfs for Belle Fourche just below Rattlesnake to 10.3 cfs for Donkey Creek near Moorcroft. The maximum run-off generated historically is much higher than the calculated 0.22 cfs from the CBM operation.

Comment 13, Page 4-5
Under Water Flow the statement is made that "CBM generated flows within the project area are expected to increase from 15.1 million gallons per day to a maximum of 66.1 million gallons per day." To put this in perspective, 66.1 million gallons per day, 102 cfs from all wells, represents a volume that is less than 2% of the annual precipitation of 14" across the EIS area.

Comment 14, Page 4-14
The bullet point beginning "Discharges will be limited..." needs to be clarified. As written it is open for at least two interpretations.

Comment 15, Page 4-36
In the paragraph beginning "Over most of the..." the statement is made "This clay unit has the effect of partially isolating the coal from the overlying Wasatch sands." This clay unit was previously characterized as being 11'-363' thick and normally at least 30' thick. It can be stated that a clay member of 30' thick is more than a partial barrier to water flow or migration. A clay or shale formation 30' thick does not allow any water to pass. It is a total barrier, not a partial barrier. This clay or shale formation serves as the trapping mechanism for the natural gas. If gas is unable to pass through this barrier, water will not be able to pass through it either.

Comment 16, Page 4-41
In the paragraph beginning "Drawdown impacts in the overlying Wasatch..." the statement is made that "drawdown is predicted to continue after the cessation of the project, averaging 125 feet long-term." It is important to note that this prediction is for water sands immediately above the producing coal interval. Shallow Wasatch sand aquifers have actually been increasing in head. Two monitor wells of very shallow sand aquifers in SE/NE Sec. 22-T48N-R72W, indicate increasing static water levels. Similar trends can be observed in a sand aquifer monitor well in SW/SW Sec. 7-T47N-R72W, and a sand aquifer monitor well in SW/SW Sec. 25-T46N-R72W. It can be presumed that at least part of the increase in static water level of the shallow Wasatch sand aquifers can be attributed to recharge due to CBM water being discharged at the surface.

Comment 17, Page 4-68
Regarding the paragraph beginning "Emission rates that were analyzed...", emission rates are cited that are the upper limit or maximum allowed under Air Quality Permits. If these limits are exceeded, the permit can be canceled. This requires the operators of this equipment to maintain and operate the compressors such that the actual emissions are below this maximum. By using this upper limit as the emission rate in the air quality model, the model becomes inherently conservative and will predict a greater impact on air quality than what will actually be observed.

Comment 18, Page 4-75 (Table 4-9) and Page 4-151 (Table 4-20)
Regarding Visibility impairment in the EIS and surrounding area. The cited tables indicate the visibility effects of the CBM development compared to the coal mining operations contribution. It should be noted that the CBM contributions were modeled using permitted maximum emission numbers while coal mines were modeled based on the projected production (expected actual, not permitted maximum). Based upon this, the CBM contribution to the air quality is conservative and consequently the impact is overstated. Even with this excessive estimation of CBM contribution to air quality impact, there is only one day with a deciview change greater than 1.0. Page 6-6 of the Air Quality Impact Analysis indicates that a "one to two deciview increment change in visibility may be noticeable." (emphasis added) The highest change for days over 0.5 and less than 1.0 was 0.86 deciview while most were closer to 0.6, slightly above the threshold which is set at approx. a quarter of the perceptibility level by the Forest Service. Levels generated by coal mine activities above 1.0 range from 5 to 9 deciview change. By comparison, CBM impacts are relatively small. The model shows that coal mining is the single largest contributor to visibility impairment in the PRB.

The air quality study utilized a CALMET/CALPUF model. This model is the best in use at this time. Considerations take into account meteorology including changing wind directions, temperatures, etc. as well as chemical reactions taking place in the "puff". The next best model is the EPA's Industrial Source Complex Short Term 3 (ISCST3) model which is a plume dispersing model. The CALMET/CALPUF model uses discrete "puffs" of pollutants and more closely models the atmospheric effects in the area. This model is consistent with the recommendations of the Interagency Workgroup on Air Quality Modeling (IWAQM) coordinated by the EPA. The CALMET/CALPUF model is the best model currently approved by the EPA.

Comment 19, Appendix B-3
Permitting of reservoirs is normally accomplished by the land owner. Operators can assist the land owner in preparing and obtaining the necessary design work and permits. However, the land owner usually prefers to have the reservoir(s) permitted in their name.

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Lance Oil & Gas Company, Inc. appreciates the opportunity to comment on the draft EIS for the proposed project. The quality of this document is an indication of the BLM's and cooperating agencies commitment to protecting the natural resources of this nation while allowing responsible development to continue. The thoroughness and level of detail of this study will be a valuable resource in future studies in this general area in addition to the current project.

Sincerely yours,

David Osmandi
Engineering Supervisor

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Rio Algom Mining Corp.

Dennis E. Stover, Ph.D.
Vice President
Engineering & Project Development

July 14, 1999

BUREAU OF LAND MANAGEMENT
19 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Mr. Richard Zander
U.S. Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

Re: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement

Dear Mr. Zander:

Rio Algom Mining Corp. (RAMC) and its wholly owned subsidiary control over 50,000 acres of uranium mineral rights containing in excess of 60 million pounds of uranium resources within the state of Wyoming. RAMC is a U.S. corporation with headquarters in Oklahoma City, Oklahoma. It is a wholly owned subsidiary of Rio Algom Limited (RAL) which is an international mining company based in Toronto, Canada. RAL is a public traded company with listings on American, Toronto, and Montreal exchanges.

RAMC has reviewed the subject EIS and has significant concerns regarding the potential impact of the proposed actions on (1) RAMC and the Wyoming uranium mineral owners within the Powder River Basin, and (2) the future quantity and quality of groundwater resources withing the State of Wyoming. The draft EIS contains a number of observations and conclusions regarding the interaction of proposed coal bed methane operations with the subsurface fresh water resources. These evaluations and findings, RAMC believes, are incomplete.

Rio Algom Mining Corp. (RAMC) is actively mining uranium in Converse County, Wyoming by means of In Situ Leaching (ISL) technology at its Smith Ranch Uranium Project (SRP). During the past eleven (11) years, RAMC has invested over $100 million (US) in the acquisition and development of uranium rights and properties in Wyoming. Included within this total is $42 million (US) which has been expended since early 1996 in the commercial development of Smith Ranch. In addition, over $5 million has been spent since mid-1997 for the development of a second ISL commercial mine at Reynolds Ranch which lies immediately north of the SRP.

At present, on-site employment at the SRP is 80 RAMC employees. In addition, 60 drilling contractor employees are active at the site. RAMC also operates a Wyoming exploration program with offices in Casper, Wyoming. Commercial scale operations at SRP began in late 1997, were ramped up to full production during 1998 and early 1999. Production during 1999 will exceed 1.5 million pounds as U3O8 per year which will result in SRP being the single largest domestic uranium mining operation for calendar 1999. During 1999, SRP will expend $16.7 million on direct payroll and local purchases within Natrona and Converse Counties. Utilizing a 4:1 multiplier, the SRP provides a local economic impact in the neighborhood of $67 million annually. In addition, state and local tax contributions will exceed $700,000.

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19 1999

The ISL technology has been described as a benign mining method which is accompanied by minimal short-term environmental disturbance and no long-term impact. As such, it has become a preferred mining method wherever the natural geologic and hydrologic setting is conductive to its application. Key to this is the natural hydrostatic pressure associated with the permeable host sandstones which contain the uranium deposits. It is the natural hydrostatic pressure which holds oxygen and carbon dioxide in solution. These are the reactants which dissolve and stabilize the uranium in the water during mining. Any reduction or loss of the natural water table (hydrostatic pressure) reduces the solubility of dissolved oxygen and causes a geometric reduction in uranium production. If the water table drops to or below the depth of the uranium deposit it becomes physically and chemically impractical to recover the uranium by ISL methods. This effectively destroys the economic value of the mineral resource. It is unlikely that potential ISL extractable uranium deposits can be exploitable by traditional higher cost methods such as open pit or underground mining. Hence, initiation of any coal bed methane program which removes substantial quantities of natural groundwater from the immediate proximity of RAMC controlled uranium deposits raises concerns because such actions could cause irreparable economic harm to RAMC and to mineral owners who may be denied royalty income which otherwise would have accrued from RAMC's exploitation of the uranium minerals.

Within the area of the Wyodak Coal Bed Methane Project, RAMC controls approximately 10,500 acres of uranium mineral rights in combination with about 8,400 surface acres. These holdings are known to contain 9 million pounds as U3O8 of uranium resources and reserves. These holdings are in various stages of development ranging from exploration tracts to pre-development mining projects.

As noted on page 3-7 of the EIS, the southwestern portion of the Coal Bed Methane study area lies within the Pumpkin Buttes uranium mining district. The statement that "there are currently no active mines or plans for new operations within the study area" is not accurate.

RAMC is presently evaluating its uranium holding in T42N R75W (within the CBM study area) as part of its intermediate term planning (5-10 year horizon) for new, additional ISL production. Other ISL uranium mining companies with holdings within the study area may be conducting similar studies. These uranium resources all reside in the Wasatch/Fort Union aquifer group. The Wasatch is underlain by the Wyodak coal; the source of coal bed methane for the proposed project. The close vertical proximity of these uranium resources to the Wyodak coal points to high probability that groundwater within the uranium resources will be diminished by the proposed pump and discharge method of coal bed methane recovery.

RAMC believes that it is essential to the welfare of Wyoming owners of uranium and other mineral rights that additional baseline hydrology tests and studies must be conducted prior to the installation of any new Coal Bed Methane wells in areas with known uranium resources.

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The focus of such hydrology tests should be to directly demonstrate the degree of vertical communication between the target coal seam (aquifer) and both the overlying and underlying sandstone aquifers. Test results can then be utilized to calibrate ground water simulators such as MODFLOW which can be used to provide a better estimate of the impact of the proposed action on the groundwater from the State of Wyoming and the mineral rights of private individuals, the State of Wyoming, and the United States Government.

Given adequate market conditions, the Pumpkin Buttes mining district will be the location of new commercial ISL uranium operations. However, excess withdrawal of fresh groundwater from coal and sandstone aquifers without a concurrent effort to protect the uranium resources in these areas will greatly diminish these prospects along with the associated potential for local job creation and economic growth. On page 4-3 of the EIS, the statement is made that "Developing the project would not be likely to impact the recovery of other mineral resources in the area....Subsurface uranium deposits located near the southwestern portion of the project are associated with Wasatch Fm. sandstones....Withdrawal of CBM and water from the stratigraphically lower Ft. Union Fm. would not be likely to impact the potential recovery of uranium resources within or near the project area....future conflicts would be dealt with on a case-by-case basis." As noted and explained previously, the statement that CBM would not be likely to impact uranium recovery by ISL can not be accepted by RAMC without supporting documentation and additional baseline hydrology studies on potential CBM project areas are strongly recommended to test this statement.

It is certain that conflicts will arise between CBM projects and other producers of mineral and energy resources. The resolution of such conflicts will be enhanced if a common state regulatory structure governs the activities of all affected resource recovery operations occurring within the groundwater resources of the State of Wyoming. It is therefore recommended that the Wyoming Department of Environmental Quality have primary state jurisdiction over all CBM operations within the State of Wyoming. This should result in a level playing field wherein all resource recovery operations are given equal consideration and are subject to similar regulations with respect to air, land, and water quality protection issues.

RAMC appreciates the opportunity to review the draft document and to submit comments.

Respectfully submitted,

Dennis E. Stover, Ph.D.
V. P., Engineering & Project Development

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DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES
JOE FOSS BUILDING
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PIERRE, SOUTH DAKOTA 57501-3181
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July 14, 1999

Richard Zander, Assistant Field Manager
U.S Department of Interior
Bureau of Land Management - Buffalo Resource Area
1425 Fort Street
Buffalo, WY 82834

Re: Comments on Wyodak Coal Bed Methane Project

Dear Mr. Zander:

Thank you for providing the opportunity to review and comment on the draft environmental impact statement (EIS) for the Wyodak Coal Bed Methane Project. This letter outlines the department's concerns with the air quality impacts to South Dakota.

With the information provided in the draft EIS, it appears the Wyodak Coal Bed Methane Project will not adversely impact the visibility of Class I or Class II areas in South Dakota. The department is concerned, however, with the modeling analysis that addresses visibility issues in Class I areas. It appears the analysis only included sources constructed after 1997, the Coal Bed Methane Project and projected coal mining activity.

We understand the background visibility monitoring was inputted in the model to account for existing sources. To get a true picture of environmental impacts to Class I areas and to verify existing visibility monitoring data collected at the Badlands National Park and the other location used in Wyoming, we suggest that all existing major sources within the 250 miles radius of the project be modeled. This should include major prescribed fire burns conducted by the Federal Land Managers. The results of the model should be compared to the visibility monitoring data to verify the accuracy of the model. Once the visibility model has been verified with actual visibility monitoring, then the Coal Bed Methane Project and projected coal mining activities should be added to the model to determine visibility impacts to South Dakota's Class I areas.

This comparison is important for regional haze modeling efforts that will be conducted by South Dakota and other states. Therefore, it is imperative the Bureau of Land Management results be based on reasonable modeling inputs in comparison to existing real data.

Again, thank you for the opportunity to review and comment on the EIS. We hope our comments assist in the development of the EIS and look forward to hearing from you.

Sincerely,

Nettie H. Myers

Nettie H. Myers
Secretary

cy: Dennis Hemmer, Wyoming DEQ
Jon Notar, National Park Service

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

BUREAU OF LAND MANAGEMENT
19
BUFFALO FIELD OFFICE
BUFFALO WY

ES-61411
[illegible]

July 15, 1999

Memorandum

To: Richard Zander, Bureau of Land Management, Buffalo Field Office, Buffalo, Wyoming

From: Field Supervisor, Ecological Services, Cheyenne, Wyoming (ES-61411)

Subject: Wyodak Coal Bed Methane Project Draft Environmental Impact Statement

We would like to bring to your attention some new information that our office has recently received regarding the sturgeon chub (*Macrhybopsis gelida*). This information is important for your consideration in the evaluation of the Wyodak Coal Bed Methane Project in Converse and Campbell Counties, Wyoming. These comments supplement our previous comments on the Draft Environmental Impact Statement for the project.

The sturgeon chub is a candidate for listing under the Endangered Species Act of 1973 (Act), as amended. The Service announced a positive 90-day finding on December 29, 1994, (Federal Register, Vol. 60, No. 11, 3613-3615) that substantial information existed to indicate that listing the sturgeon chub as endangered may be warranted. However, due to a Congressional action that placed a moratorium in 1996 on all listing actions, the processing of the listing package for the chub was not authorized until 1997. It is likely this species will be proposed for listing under the Act in the relatively near future.

Historically, the sturgeon chub occurred throughout the main stem of the Mississippi and Missouri Rivers. The species was also found in the Yellowstone River in Montana and a total of 34 tributaries to the Yellowstone or the main stem Missouri River throughout the Missouri River basin. In Wyoming, the sturgeon chub occurred in four tributaries including the Powder, Big Horn, Tongue and North Platte Rivers. Populations of the sturgeon chub in Wyoming still occur in the Powder River, and may exist in the Big Horn River. When considering the loss of tributary habitats, we estimate the sturgeon chub now occupies about 20 percent of its historical range.

Any actions that may affect the sturgeon chub, including the discharge of coal bed methane wastewater that may increase flows or carry selenium concentrations to the Powder River or its

tributaries, should be evaluated. If sturgeon chub are listed prior to completion of this project, consultation under section 7 of the Act may be necessary.

These comments are made pursuant to the National Environmental Policy Act, the Endangered Species Act, and the Fish and Wildlife Coordination Act. Please keep this office informed of any developments or decisions concerning this project.

If you have any questions please contact Kim Dickinson of my staff at the letterhead address or phone (307) 772-2374, extension 36.

cc: Director, WGFD, Cheyenne, WY
Nongame Coordinator, WGFD, Lander, WY
Wyoming Outdoor Council, Lander, WY

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BARRETT RESOURCES CORPORATION

BUREAU OF LAND MANAGEMENT
JUL 20 1999
BUFFALO FIELD OFFICE
BUFFALO WY

July 14, 1999

United States Department of the Interior
Bureau of Land Management
Buffalo Resource Area
1425 Fort Street
Buffalo, WY 82834
Attention: Richard Zander

RE: Wyodak CBM DEIS Public Comments

Dear Mr. Zander:

Barrett Resources Corporation, a MOU participant company, supports the Wyodak CBM DEIS and encourages a timely issuance of the ROD by the Bureau of Land Management.

In support of the modeling effort, Barrett presents the following comments:

- Modeling efforts for Air Quality and Ground Water were based on the best available data as provided by governmental agencies such as BLM, WDEQ, NPS, USFS, USEPA, USGS and NRCS. Industry also provided appropriate data.
- The results and conclusions to be drawn from the modeling effort are to be accepted in light of the data input, the model's technological competence, and the point in time that the data was collected and input into the models.
- The models, particularly the Air Quality Model, could have a multitude of input changes with infinite reruns to the point of the investigating the exhaustion of reruns; the result would still remain the same.
  - Cumulative impacts from the existing urban and mobile sources currently exceed regional haze visibility limits.
  - Wyodak CBM EIS cumulative impacts are negligible as compared to existing impacts and amount to "a drop in a bucket" that is already overflowing.
- The models are "computer models" not irrefutable fact and as such may require periodic update with actual data. The timing and format for upgraded model runs and comparison with these runs may be determined and funded by the appropriate governmental agency.
- CBM MOU participants have been financially burdened to provide the analysis to this point. The current evaluation is far and above the original scope of the EIS, reflecting additional modeling requirements for mobile sources, expanded EIS area, new pipelines and resulting additional compressors and pod sites, expanded air quality modeling area, and increased detail demanded by WDEQ, NPS and USFS.

In addition, Barrett Resources provides the following attachment as our comments for the Draft EIS.

Barrett congratulates BLM, Greystone and participating agencies as well as the other MOU participants for the thorough and technically sound document.

Sincerely,

Thomas E Doll

Thomas E. Doll, PE
Senior Petroleum Engineer

Xc: Duane Zavadil
Joe Barrett

BUREAU OF LAND MANAGEMENT
JUL 20 1999
BUFFALO FIELD OFFICE
BUFFALO WY

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ATTACHMENT

The following comments are provided by Barrett Resources regarding corrections and clarifications of the Wyodak CBM Draft EIS document.

Page 1-5, First three paragraphs under Authorizing Actions. The language at the end of the first paragraph and in the subsequent two paragraphs must be modified to reflect the recent Supreme Court ruling.

Page 2-1, Second paragraph under Summary, second sentence. Some mention should be made of the fact that some operators have sought 80 acre spacing for their CBM acreage.

Page 2-1, paragraph under Anticipated Level of Activity.... This sections mentions that there may be up to 400 federal APDs approved per year and goes on to estimate the number of rigs required to drill those wells. The number of rigs required would be better related to the total number of wells to be drilled, inclusive of those on fee lands.

Page 2-1, paragraph under Hydrologic Monitoring and Mitigation, last sentence. Reword as follows "...timeframes; and data management for both groundwater and surface water".

Page 2-16, Section on Hydrologic Monitoring and Mitigation. A paragraph or two on the legal framework would be useful. Specifically, this section should explain that groundwater is a resource of the state, rather that real property and that the state grants a right to use the water based on the benefit that the water provides. In the case of CBM, the benefit is the gas production.

Page 2-17, Paragraph under Groundwater. The second reference to BLM is redundant.

Page 2-17, Second bulleted item under Groundwater. Insert "in" after the word "concentrations".

Page 2-17, Last sentence in the third paragraph. We appreciate the fact that the efforts will be put towards coordinating the monitoring effort. We suggest that the data objectives also be considered in this effort. That is, describe how data is to be used and what decisions are to be made on the basis of this data. It is our experience that data collected without close consideration of well-defined objectives is of little value.

Page 3-8, Last paragraph, third sentence. Reword as follows: "...produced water are typically expressed ...".

Page 3-10, Second paragraph under table, first sentence. Strike "above that observed under natural flow conditions". Reference should not be made to "natural flow conditions" without the explanation of evaporation and transpiration.

BUREAU OF LAND MANAGEMENT

Last sentence. Add "current" before "CBM generated flows".

Page 3-13, first paragraph, first sentence. Add "actual" before "outflow".

Page 3-13, First paragraph. The amount of additional flow contributed to the major surface water bodies by CBM is a major issue. The assumptions on conveyance provided by the WSEO are reasonable for perennial creeks, rivers and canals but should not be applied in this analysis without caveats. It is very difficult to predict what the actual yield will be in situations where a small discharge occurs in a small upland drainage. It is not hard to imagine a small discharge, say 20 to 30 gallons per minute, that may never flow a mile, let alone suffer a loss of only one percent as suggested by the assumption. The assumption and analysis should stand as is but a statement should be made that the project flows are conservation for the reason described above.

This provides estimated flows, based on the assumptions, under current conditions. It would be useful to perform a check on the assumptions by comparing the estimated increase in flows to actual observed flow rates. In effect, lets use the knowledge of what has occurred in the past to predict future effects.

Page 3-13, Third paragraph, last sentence. This sentence implies that the mines are in fact discharging pyrite that would cause acid mine drainage if pH conditions were not limiting. If true this should be more clearly stated and significance to CBM described.

Page 3-21 Sentence carried from previous page and completed here is unclear.

Page 3-25, First complete paragraph. Based on the data in Table 3-7, Gillette's municipal water usage is much greater than 2 millions gallons per year.

Page 3-26, Last paragraph. The first sentence in this paragraph is prejudicial. There is an implication that oil and gas and mining normally foul the air. However, if restated in another way, this could be complimentary.

Page 3-40, Last part of first paragraph. This paragraph is drawing the conclusion that human activity and disturbance are the cause of the sage grouse population decline. Population declines could be the result of many other factors such as predators, weather, disease, etc. Unless substantiated, this section should state facts only.

Page 4-5 Second paragraph under "Water Flow". The same comment made regarding losses in small, upland discharges applies here.

Page 4-10, Fourth paragraph. Restate first sentence as follows: "Daily sediment concentrations will increase if...".

Page 4-11, First paragraph under "Water Use". The third sentence states as if it is a fact that diversions increased by 41 percent. Based on estimation approaches used earlier in the EIS, water yield is based on broad assumptions that may result in an overestimate for

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small, upland discharges. If diversions in fact did increase by the amount stated, a reference should be provided. If not, the estimate should be conditional and the assumptions referenced.

Page 4-14, First Paragraph under "Mitigating Measures". Insert "by the operators" after "developed" in the first sentence.

Page 4-36, Second full paragraph. I'm left wondering how many wells are actually completed in the coal and what their current uses are.

Page 4-71, Fourth paragraph. Insert in first sentence: "...would address monitoring and if necessary mitigation to...".

Page 4-149, Regional Haze Impacts section. Although the project duration is frequently considered with regard to other resources considered by the EIS, little mention of it is made in the air quality analysis. When considering impacts, the BLM must consider that CBM emissions are temporal. Emissions that associated with development initiated in the late 1980s will be essentially eliminated by 2009. Emissions from current CBM development will be eliminated by 2020 or sooner. Emissions from existing conventional oil and gas development will also be essentially eliminated by 2020. Although it would unnecessarily complicate the modeling process to include this factor, it should be a very important factor to the decision-maker within the BLM. This subject requires an analysis and elaboration within the EIS.

Duane Zavadil

BUREAU OF LAND MANAGEMENT
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FAX TRANSMITTAL # of pages 2
To Dennis Stenger From Al Baca

File Code: 2580

Date: JUL 14 1999

JUL 22 1999

99 JUL 22 AM 10:00

RECEIVED
CHEYENNE, WYOMING

Alan Pierson, State Director
Bureau of Land Management
P.O. Box 1828
Cheyenne, WY 82003-1828

Dear Mr. Pierson:

We have reviewed the Air Quality Impact Analysis prepared for the Wyodak Coal Bed Methane Project Environmental Impact Statement and offer the following comments and observations. First, we greatly appreciate the outstanding job that the BLM did in forming a stakeholders group to review and provide input into the development of the air quality impact modeling protocols. The multiple opportunities for feedback, input and suggestions that the stakeholders had during the preparation of this Air Quality analysis exemplifies the interagency cooperation and communication that Federal Agencies in the Rocky Mountain States have been working towards in NEPA air quality issues.

The Air Quality Impact Analysis estimates that NOx (nitrogen oxide) emissions from the Proposed Action's gas compressors would be 2,886 TPY (tons per year) of NOx. Other cumulative source increases (point sources such as recently permitted power plants, coal mines, and coal trains) are estimated to total an additional 15,486 TPY of NOx. While the exact amounts of future cumulative emissions of NOx are difficult to estimate accurately, we commend the BLM for making the effort to assess and disclose their best estimate of what these emissions might be in the future.

We do have some questions about the information on alternatives presented in Table 1-1. The table shows 3000 wells under the Proposed Action and 5000 wells under Alternative 1, but the same number and capacity of compressor stations for both alternatives. We understand that production and compression is limited by pipeline capacity, but have been unable to find specific discussion of this situation in the DEIS. We are concerned about the pollutant emissions ramifications of Alternative 1, should the BLM choose that alternative, especially with the lack of clear discussion of pipeline capacity issues and what would happen under the 5,000 well scenario with potential additional future pipelines and compression. The document states on pg 1-14: "The companies' field-wide compression plans, currently under development, are not constrained by the scope of this EIS analysis and the number or production wells under consideration here." We recommend that the BLM not consider Alternative 1 for selection unless additional information relevant to pipelines and compression is disclosed, specifically that additional compression emissions associated with the additional 2000 wells are modeled and their impacts on sensitive wilderness areas are analyzed.

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We would also like to offer a correction in the interpretation of FS policy given on pg 4-6. The text states that "...more than one day with a computed deciview change exceeding 0.5 deciview is considered an adverse impact." The correct statement should instead read, "a computed deciview change on or greater than one day that exceeds 0.5 deciview is above the threshold of concern ("limit of acceptable change") for visibility impairment, and may, under some circumstances, be considered an adverse impact."

The visibility modeling estimates that the impacts from the proposed action by itself could result in an increase in visibility impairment (modeled deciview change above .5 deciview) by one day at each of the nearest Forest Service managed wilderness areas (Black Elk Wilderness and Cloud Peak Wilderness). Taking into consideration the large project area over which emissions would be dispersed and the conservatism of the visibility background data that was used in the analysis, we do not believe that there would be likely to constitute an adverse impact at either of the two wilderness areas. To ensure that adverse impacts do not occur at these wilderness areas we would encourage the BLM to consider mitigation measures such as electric compression for compressor or station engines on BLM lands, so that NOx emissions are further reduced. ✓

We do have significant concerns regarding the magnitude of the visibility impacts projected to these two wilderness areas from cumulative sources. The analysis projects 58 days where visibility would be above the Forest Service Limit of Acceptable Change in the Black Elk Wilderness and 23 days for the Cloud Peak Wilderness. This means that a perceptible decrease in the clean clear views that the public expects to see in wilderness would occur on each of these days. If these decreases in visibility were to occur, we believe that it would be contrary to the Wilderness Act direction to care for wilderness such that it is "protected and managed so as to preserve its natural conditions" and to "promote, perpetuate and where necessary restore the wilderness character of the land." We realize that the BLM does not have direct control over many of these projected future emissions that are discussed in the cumulative impacts analysis, so we will strive to address some of these concerns for future air quality impacts in north east Wyoming and western South Dakota in other forums. We will suggest that the state regulatory agencies (Wyoming, Montana, and South Dakota), along with EPA create a group similar to SWYTAF (Southwest Wyoming Technical Air Forum) or GCVTC (Grand Canyon Visibility Transport Commission) to address cumulative air quality impacts to sensitive FS, NPS and Tribal wildernesses in northeast Wyoming and western South Dakota within the next year.

We appreciate the opportunity to provide input on air quality issues for this technical reference document and through the stakeholder process. If you have any questions or comments, please feel free to contact Tamara Blett (303-275-5744 or TBlett/r2 or TBlett/r2@fs.fed.us).

Sincerely,

for LYLE LAVERTY
Regional Forester

cc: Dan Olson, Wyoming DEQ
Cindy Cody, EPA
Larry Svoboda, EPA

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JUL 15 1999

BUREAU OF LAND MANAGEMENT
22 1999
BUFFALO FIELD OFFICE
BUFFALO, WY

Ref: 8EPR-EP

Richard Zander
Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, Wyoming 82834

Re: Wyodak Coal Bed Methane Project
Draft Environmental Impact Statement

Dear Mr. Zander:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Region VIII office of the Environmental Protection Agency (EPA) has reviewed the referenced Draft Environmental Impact Statement (DEIS). We offer the following comments and concerns for your consideration in preparation of a Final Environmental Impact Statement (FEIS).

We understand the Proposed Action and Alternative 1- Expanded Project Area, propose development scenarios of 3,000 and 5,000 coal bed methane (CBM) production wells respectively. These wells and their accompanying field gathering lines and compressors, plus servicing gas transmission lines and compressors, are located in a 3,600 sq mi analysis area of central Campbell and northern Converse Counties, Wyoming, within the eastern portion of the Powder River Basin, north and south of Gillette. Wells would be located on lands adjacent to producing coal mines along the eastern project boundary, and would extend to a western analysis boundary located from 18 to 36 miles in the west. This analysis area has been named the Wyodak CBM Project Area.

The EPA appreciates the BLM's cooperation in arranging for BLM project personnel and consultants to meet with us and other interested Federal Agencies to explain and discuss modeling methodology and results related to water and air quality issues. The BLM is to be complimented for the DEIS's disclosure of water and air quality impacts. However, we have remaining concerns with impacts that may require additional analysis or monitoring.

Subsequent to publication of the DEIS, additional interest in future Coal Bed Methane production for areas adjacent to the Wyodak CBM Project Area has been voiced. We have heard preliminary estimates of 20,000 productive wells. If there is evidence that this estimate is more than just speculation, the FEIS should discuss how the BLM plans to address additional environmental analysis related to this increased development.

Our review has identified significant concerns related to the amount of produced water that will be discharged on the surface,(38,000 ac-ft/yr for the Proposed Action) and the length (12 to 20 years) of this discharge. The FEIS needs to discuss in greater detail potential effects from this surface discharge, both direct and cumulative, on existing flora and fauna in the Project Area, anticipated changes in populations during the production years and how effective reclamation actions will be in restoring not only ground surface disturbances but the original ecosystem as well. Ecosystems are defined by the structure and function of plant and animal communities and by the habitats used. The FEIS must discuss the potential for invasion of noxious weeds and other undesirable vegetation in the Project Area due to produced water surface disposal.

The DEIS does not contain an overall BLM monitoring plan for surface environmental impacts. The potential for significant water quality and wetland impacts from produced water is extremely high in this analysis area. While the water management plans will provide an excellent start, it is not clear how the BLM will conduct its oversight responsibilities, nor how the overall monitoring data will be used to ensure BLM compliance with Federal laws and regulations. Please see our attached detailed comments for additional discussion.

The FEIS and ROD (record of decision) should include a coordinated plan to monitor effects and indicators of potential exceedances/violations. Since this will be a complicated effort and should involve a large number of stakeholders in the development of a monitoring plan and management of produced data, a commitment in the FEIS and/or ROD is sufficient.

The EPA appreciates the opportunity to participate on the Wyodak Air Quality Advising Committee. With this participation, the EPA was assured that many of its primary concerns would be addressed prior to the air dispersion modeling effort. The EPA applauds the BLM's effort to include "Reasonably Foreseeable Future Actions" such as additional gas pipelines and expanded coal mining in its environmental impact analysis. By meeting the intent of the NEPA regulations, the BLM was able to identify significant visibility impacts that are forecasted to occur at a number of Class I areas in Montana and South Dakota. With this knowledge, state agencies and the EPA as a partnership can begin planning on ways of mitigating visibility impacts in these Class I areas.

Due to the overall significant visibility impacts predicted at the Class I areas due to cumulative sources, the EPA would expect to see a full array of mitigation actions and their associated cost and effectiveness at lowering impacts in the FEIS for the proposed project. This information would be essential for the public and decision-maker to make an informed decision on this major federal action and future actions.

As you are aware, a DEIS is being prepared for additional rail access to coal mines adjacent to the eastern edge of the Project Area. The Wyodak Coal Bed Methane Project FEIS

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will need to include additional analysis in the Reasonably Foreseeable Future Actions impacts discussion based on air quality impacts from the Powder River Basin Expansion Project proposed by the Dakota, Minnesota & Eastern Railroad Corporation (DM&E). This additional analysis will need to include impacts from projected locomotive emissions and railyards as well as probable increased coal production air quality impacts.

We understand that the BLM is developing parameters for a Regional Assessment of present and future fossil fuel related activities, including coal and CBM production, in the Powder River Basin. The EPA applauds this decision and we offer our assistance in pursuing this assessment. Any applicable information related to the Regional Assessment should be included in the FEIS.

Based on the procedures the EPA uses to evaluate the adequacy of the information in the EIS and the environmental impacts of the proposed action, this DEIS will be listed in the Federal Register as Category E.C. - 2 (environmental concerns, additional information needed). A copy of our rating criteria is attached. This rating indicates that our review and the enclosed detailed comments have identified additional information, data and discussion in the FEIS.

The EPA appreciates the opportunity to review and comment on the DEIS. If we can provide further explanation of our concerns please contact me at (303) 312-6228, or Mike Hammer of my staff at (303) 312-6563.

Sincerely,

Cynthia G. Cody, Chief
NEPA Unit
Ecosystem Protection Program

Enclosure

cc: Elaine Suriano, EPA HQ, OFA
Mike Strieby, 8EPR-EP
Dana Allen, 8EPR-EP
Tonny Ott, 8EPR-EP
Rich Mann, 8EPR-EP
Robert Edgar, 8EPR-EP
Dave Ruiter, 8EPR-EP

SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION*

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

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EPA DETAILED COMMENTS ON WYODAK COAL BED
METHANE PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

GENERAL

Pages 2-1 and 2-2, Proposed Action discussion, in particular on page 2-2 states, "Development typically would result in wells drilled within productive portions of the project area on a spacing determined by the WOGCC. The remaining less productive portions of the project area may never have any activity." There needs to be additional discussion on the role of the BLM in ensuring that the public is well served by looking at possible production in the less-productive portions of the project area rather than by-passing these less productive portions.

WATER QUALITY

The EPA commends the BLM for requiring a water management plan to be submitted as part of an APD and in cooperating with State agencies.

The density of discharging wells, pods, compressors, collectors and pumping sites will be essential to good water management. The density of discharges will be especially important when there are multiple well operators, surface and mineral ownership. How will the density of discharges, multiple ownership and related factors be addressed by the BLM? How will water management plans be integrated?

All elements of the CBM collection and delivery process will need to dispose of water. Past discussions with the BLM did include the possibility that waters may not always be separated at the well head site. Will the process the BLM has developed adequately address waters discharges after the well head and well pods? Specifically, how will well waters not permitted by the State be monitored? If there are detrimental impairments to the landscape and isolated waterbodies what corrective actions are available to the BLM?

It is not clear if the BLM will have the resources to fully evaluate the water management, continued complete inspections, and adequately monitor short and long-term environmental impacts (12 to 20 years of the project plus restoration and reclamation after methane pumping is reduced to minimal amounts). The amount of water discharged has the capability to alter the landscape and associated ecosystems significantly. Utilization of enhanced and seasonally interpreted aerial photography and GIS mapping technology to document changes in the aquatic landscape over the life of the project and for the years following the loss of CBM water discharges will improve the overall knowledge of the impacts to the analysis area.

Monitoring the impacts of this project will develop a large amount of environmental data. Future analyses and assessments for future projects, permit renewals, etc., will require adequate access to information gathered now and throughout the project. Please explain what data management is planned. Where will monitoring data be stored? Will it be available through standard data bases and will it be accessible via the Internet?

The perceived short term benefits/impairments of additional water must be evaluated as well as long-term consequences of developing an aquatic system which is dependent on additional water which will eventually not be available. It should be clarified if water quality will worsen as the ground water is pumped over a number of years and the groundwater level lowers. Changing characteristics of the surface waters, such as the increase in bicarbonate, continuous flow and lower TDS values will alter the flora and fauna that are able to survive and prosper. As the original biotic congregate is displaced by one more suitable to the new conditions, an unstable condition could develop and should be monitored closely. At the end of the project, as the reversal of the aquatic characteristics begins, the aquatic system will again need to adjust. Highly unstable systems are susceptible to a wide variety of damaging scenarios, including stream bank failure, invader/unwanted plant community development and the loss of water related beneficial uses. Monitoring the changes and interactions of the altered systems will be fundamental to maintaining a healthy aquatic system in the analysis area.

Impounded waters with unanticipated discharges not permitted by the State general or individual NPDES permits (unanticipated levels of produced water or storm unauthorized situations) should be expected. A monitoring and mitigation plan needs to be developed. In addition, there needs to be discussion related to future maintenance of the impoundment "dams" after the produced water is no longer available. Will the dams be removed and their impoundment area be reclaimed?

Standard conversion for the relationship for specific conductivity (SC) and total dissolved solids (TDS) may be adequate, but, if future data becomes available, a specific relationship would be developed (estimated) for the analysis area. The USGS or the State may already be using an area specific defined relationship. SC measurements taken by permittees and others can then be used with confidence as an indicator of water quality. Additional relationships in subregional areas for TDS and other indicator parameters may improve the ability to easily monitor water quality.

Water quality discussions seem to focus only on sediment and dissolved solids. The FEIS discussion should be revised to include potential toxic pollutants. Each and every discharge must be "free from toxics in toxic amounts". This State water quality standard is typically measured by a WET (Whole Effluent Toxicity) Test. The FEIS should disclose the toxicity of discharges from nearby existing CBM wells and estimate how many CBM wells are expected to have discharges which exhibit toxicity. The FEIS should also disclose the mitigation plans for toxicity, i.e., no pumping allowed until toxicity is removed or alternative disposal method is installed. It is anticipated that there may be toxicity problems from iron, manganese and salinity.

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Page 3-10. How are the temporary mud pits within each well area reclaimed upon completion of drilling activities? It is recommended that mud pit reclamation efforts focus on protection of underlying ground-water resources.

Page 3-12. How are the pipeline corridors reclaimed upon completion of project activities? Pipelines can provide a conduit for the transport of contaminants in the subsurface and may result, over time, in impacting ground-water resources. It is recommended that pipeline reclamation efforts focus on protection of underlying ground-water resources.

Page 3-13. "Produced water contains an average (mean value) of 764 mg/l Total Dissolved Solids based on WDEQ discharge monitoring report data..." Was this water-quality data specific to historical coal bed methane development activities in the Powder River Basin? The reference cited does not specify the source area of the data.

Pages 3-15 to 3-20. The level of effort for planned ground-water monitoring should be commended. The only question/concern here is who will review all of this data and document any adverse impacts to the proper regulating entities?

Pages 3-7 to 3-10 (Table 3-4), Water Resources-Surface Water should be revised to include protection of aquatic life. The project area includes several streams which are designated for aquatic life:

Little Powder River	Warm water fishery Class-2
Belle Fourche River	Warm water fishery Class-2
Rawhide Creek	Marginal fishery Class-3
Antelope Creek	Warm water fishery Class-2
Little Thunder Creek	Warm water fishery Class-2

The remaining tributaries are Class-4 waters, protected for only livestock and irrigation as discussed in the DEIS on page 3-14. The FEIS should disclose current conditions in these fisheries and determine if aquatic life water quality standards will be achieved throughout the project life.

Page 3-25. There are a number of public water supply wells in the project area as well as many more domestic water supply wells. The use of contracts between coal bed methane developers and local well owners to provide for replacement of water if existing wells are impacted by the development activities should be commended. However, are such contracts put into place and enforceable in all instances?

Page 4-10. The first paragraph suggests that water quality problems can be mitigated through special conditions at sites when needed. It seems more appropriate to develop a basic plan for mitigating water quality as part of the EIS process. What are the standard requirements to mitigate sediment? And, as discussed above, what are the plans to treat toxic discharges? We recommend that the FEIS establish some trigger levels for water discharges. The following are examples of criteria/standards for expected pollutants:

TDS	1,000 - 2,000 mg/L
Chloride	200 - 230 mg/L
Iron	1 mg/L
Manganese	1 mg/L
Zinc	0.11 mg/L
Sulfate	500 mg/L
WET	LC 50% (discharge lethal to 50% of test species)

We recommend contacting the Wyoming DEQ for more specifics.

Pages 4-22 to 4-44. The ground-water flow modeling effort for the DEIS looks to be a best effort based on the existing data base. Will this model be refined over time as new data is acquired to check the drawdown projections provided here? The drawdown projections from the model are significant. With the low recharge potential in the Powder River Basin, what are the long-term impacts to ground-water levels over time as the proposed project development occurs?

AIR QUALITY

Page 4-14, Mitigating Measures. The EPA recommends that costs to implement the mitigation measures and the effectiveness of the mitigation measures listed on pages 4-14 and 4-15 be addressed in the FEIS. Without this information, the decision-maker and the public have no basis on which to make a decision.

Page 4-68, Alternative 1 - Operational Impacts, third paragraph, second sentence. "These engines (i.e. Engines operating as of the end of April 1997) are already operating and are considered part of the monitored background and were not included in the air quality analysis." The EPA understands that far-field impacts do include sources permitted and reasonably expected to begin operation after 1995. Please clarify this point in the FEIS.

Page 4-71, Hazardous Air Pollutant Impacts, third paragraph, first sentence. "Therefore, to minimize the predicted risk, the largest compressor station (12,000-hp) should not be constructed and operated within two kilometers of an established residence."

The EPA recommends that this distance restriction for the largest compressor station be part of the Record of Decision. The fourth paragraph on this page states that "...the WDEQ permitting process, especially for the largest compressor engine complex, would address mitigation to lessen the formaldehyde risk." WDEQ does not have any hazardous air emission regulations, and therefore, formaldehyde emissions would not be addressed in the air permit for the compressor station. Formaldehyde is listed as a hazardous air pollutant in 40 CFR Part 63 Subpart HHH - National Emission Standards for Hazardous Air Pollutants From Natural Gas Transmission and Storage Facilities. The Wyodak FEIS should state whether or not this regulation would be applicable to the proposed 12,000 hp compressor station.

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Page 4-71, Hazardous Air Pollutant Impacts, fourth paragraph, second sentence. "Possible mitigation to lessen the formaldehyde risk could include raising the stack to reduce ground level impacts or adding a CO catalytic oxidizer... ." Recommend that the costs associated with the suggested mitigation be listed in the FEIS to provide information to the public and the decision-maker as to which mitigation could be suggested in the ROD.

Page 4-78, Visibility Impacts. "The impacts under the No Action Alternative would be expected to be similar to those described under Alternative 1." As stated on page 2-23, up to 2,500 of the proposed wells would be located on lands where CBM rights are owned by the federal government. With a 2,500 well difference, Alternative 1 would be expected to have a greater impact on visibility due to increased NOx emissions from additional compressor emissions associated with gas production. As stated in CEQ's 40 Most Asked Questions, Number 3, " "No Action" in such cases would mean the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative to go forward." The EPA recommends that a "No-Action" Alternative be analyzed for environmental impacts so that its impacts can be compared to the impacts from the Proposed Action and Alternative 1.

SPECIFIC COMMENTS ON THE TECHNICAL REFERENCE DOCUMENT - Wyodak CBM Project Air Quality Impact Analysis

Page 3-11, Section 3.2.3.1 Vehicle Road Dust, first paragraph, fugitive road dust equation. "p = number of days with more than 0.01 inches of precipitation; 100 for the expanded project area." Please provide justification for the 100 days/yr of precipitation. For an arid area, one would expect many fewer days that 100 per year especially for precipitation covering the entire project area. This comment also applies to Section 5.4.1.3 on page 5-21.

Page 5-34, Table 5-13, Cumulative Pollutant Emissions, Recommend that SO2 and PM10 emissions for locomotives be included in Appendix D - Emission Factors for Locomotives. These emissions will also contribute to visibility impacts at the sensitive receptor sites.

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United States Department of the Interior

NATIONAL PARK SERVICE
Air Resources Division
P.O. Box 25287
Denver, CO 80225

BUREAU OF LAND MANAGEMENT
22 '99
BUFFALO FIELD OFFICE
BUFFALO WY

July 14, 1999

N3615 (2350)

Richard Zander
Bureau of Land Management
1425 Fort Street
Buffalo, Wyoming 82834

Dear Mr. Zander:

The National Park Service (NPS) Air Resources Division has reviewed the Draft Environmental Impact Statement (DEIS) and the Air Quality Analysis for the Wyodak CBM Project, and has the following comments. The proposed Wyodak project is located 185 kilometers (km) and 230 km from Wind Cave National Park (NP) and Badlands NP, respectively. Both parks are mandatory Class I areas administered by the NPS. The proposed Wyodak project is also 90, 155, and 180 km from Devils Tower National Monument (NM), Jewel Cave NM, and Mt. Rushmore NM, respectively, which are Class II areas administered by the NPS.

The air quality analysis examined impacts from the proposed project and other sources in both the near and far fields. The near field analysis was performed with the EPA Industrial Source Complex Short Term Model (ISCST3). The annual nitrogen dioxide (NO_2) impact from the proposed Wyodak project is 9.0 micrograms per cubic meter ($\mu g/m^3$), which is below the Class II PSD increment of 25 $\mu g/m^3$. When Wyodak's impact is added to the 1996 monitored background NO_2 concentration and the modeled impact of all new emissions of NO_x constructed since 1996, the maximum concentration is 49 $\mu g/m^3$, which is below the National Ambient Air Quality Standard of 100 $\mu g/m^3$.

The far field analysis was conducted with the EPA CALPUFF/CALMET modeling system. This analysis used 1990 MM4 prognostic data as well as data from the National Weather Service's 5 surface and 3 upper air stations in the region. Impacts to the Class I and II areas were evaluated against the respective increments as well as visibility and acid deposition impacts. The impacts from the proposed Wyodak project and Wyodak plus other newly permitted increment consuming sources were evaluated. The impacts from the Wyodak project alone are well below the short and long term PSD Class I and II increments for NO_2 and PM_{10} at all of the NPS units modeled. The cumulative impact analysis indicates that the impacts are well below the short and long term Class I and II increments for NO_2, PM_{10} and SO_2. We realize that this was not a complete cumulative increment tracking analysis, due to the cut off emissions inventory year being new emissions after 1996. We believe that although this is stated deep in the body of the text of the document, it should be emphasized in the Final EIS so as not to mislead the reader.

The reported impacts of nitrogen deposition from the Wyodak project are below levels expected to affect resources at any of the NPS units. In addition, the cumulative analysis indicates that nitrogen and sulfur deposition is below levels expected to affect resources at any of the NPS units.

The regional haze visibility analysis followed the recommendations of the Interagency Workgroup on Air Quality Modeling (IWAQM) and the NPS. Impacts calculated from the proposed Wyodak project alone, and the cumulative analysis sources, were included in the visibility analysis. The visibility analysis indicates that the Wyodak project alone would cause a change greater than 0.5 deciview (or a 5% change in background extinction) for 4 days at Badlands NP and for 3 days at Wind Cave NP. Based on the frequency, magnitude, and duration of the impacts, the NPS has determined that the impacts from the Wyodak project alone are not adverse.

The cumulative visibility analysis indicates significant adverse impacts to visibility in both the frequency and magnitude of the modeled impacts at both Badlands NP and Wind Cave NP. The NPS considers that a 10% change in extinction (1.0 deciview change) is an adverse impact in a NPS Class I area. The visibility analysis of non-project sources indicates that there are 87 days and 76 days of impact above 10% change in extinction at Wind Cave NP and Badlands NP, respectively. Badlands NP is only one of two National Parks in the country where the worst visibility days (the worst monitored 20% of days) are getting dirtier. This trend is contrary to the goal in the Regional Haze Regulations. The non-project analysis has actually underestimated the impacts to regional haze by not including the diesel soot particulate and SO_2 emissions from the coal haul trains.

We realize that Wyodak is only a small contributor to the modeled and monitored visibility impairment. Consequently, regional strategies will need to be developed to deal with the visibility issue. We are hopeful that the June 29, 1999, meeting held in Denver, Colorado, with the BLM, State of Wyoming, EPA Region VIII, U.S. Forest Service and NPS is the first step in the process of revising the Wyoming visibility State Implementation Plan to reduce these modeled and monitored visibility impacts to the Badlands and Wind Cave NPs.

If you have any questions regarding these comments, please contact John Notar of my staff at (303) 969-2079.

Sincerely,

John Bunyak
John Bunyak
Chief, Policy, Planning and Permit Review Branch

BUREAU OF LAND MANAGEMENT
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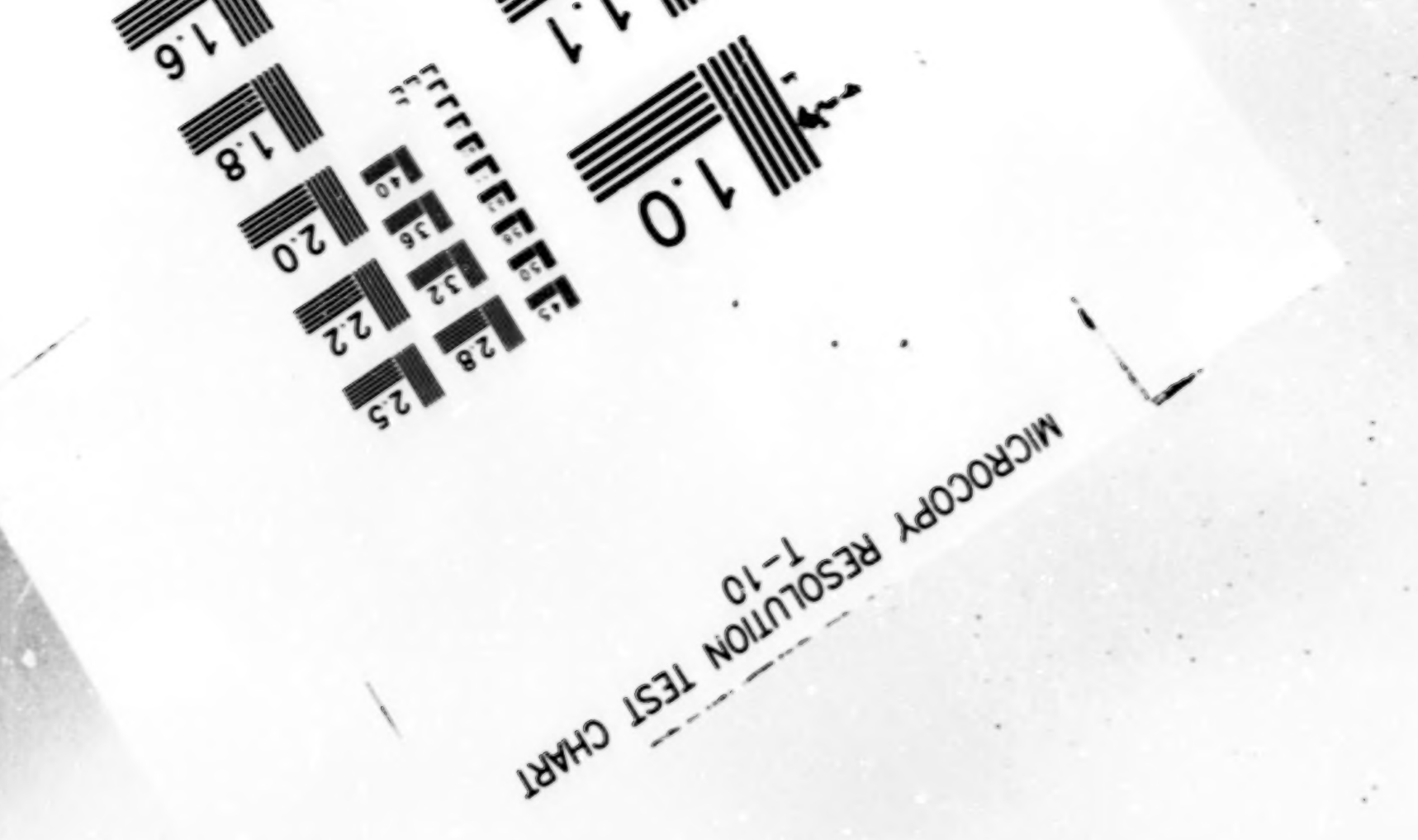
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